ARMY R,D&A

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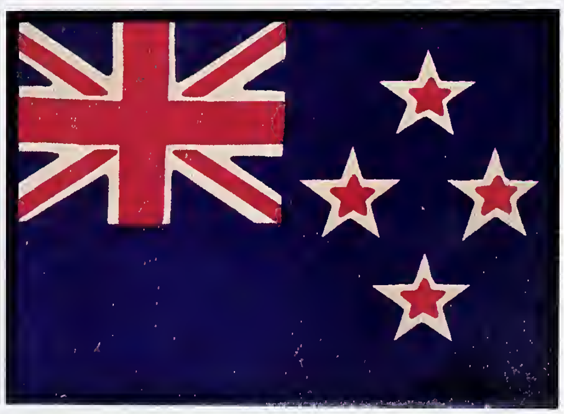
JANUARY - FEBRUARY 1982

ABCA TEAL



ARMY R,D&A

Vol. 23 No. 1 **JANUARY-FEBRUARY 1982**

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ABOUT THE COVER:

Shown on the front cover are the national flags of America, Britain, Canada, Australia, and New Zealand—member countries which comprise the "ABCA" Program and TEAL standardization conferences. Official emblems of the various National Standardization Offices are displayed on the back cover.

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Foreword

The March 1979 issue of *Army RDA Magazine* focussed on the relationship of Army RDA and NATO as well as providing a look at the way other NATO powers conducted their materiel acquisition. The July/August 1980 issue described the role of the U.S. Army's out-of-country research, development, and standardization agencies.

This issue is featuring the ABCA (America-British-Canadian-Australian) Program prompted by the recent TEAL XXIII conference. Six feature articles of this issue describe the purpose and working of the important ABCA Program, the Basic Standardization Agreement that is the cement for that program, and the TEAL meetings that are the high level policy and guidance mechanism of the program.

The TEAL meeting in Montreal, Canada, in October 1981, was the 23rd such get-together of Vice Chief/Deputy Chief of Staff level representatives of the four English-speaking signatory members of the program.

Actually, the TEAL meetings had somewhat different and later origin than the ABCA Program per se. They began in 1955 when the British Director of Infantry suggested that it would be helpful for a forthcoming infantry conference of infantry officers of the three powers, if the respective chiefs of staff could be induced to meet and decide on broad national guidelines upon which the conference might base its actions.

The proposal was passed to the respective chiefs and adopted, along with a widened scope, and the first meeting was hosted by the British in June 1957, and was known as "Tripartite Conference on Tactics-1957."

Subsequently dubbed "TEAL", according to the memory of one early attendee because the theme of the first meeting was tactics, equipment, and logistics, the title of the meetings has stuck, and the popular symbol used in connection with these meeting is now that of the Teal duck.

The current ABCA Program formally began in 1947 as a result of WW II experience, as a loose agreement by the U.S., Britain, and Canada to try to standardize equipment and doctrine. It was altered and redefined in 1954 as a standardization concept agreement, and in 1964 it evolved into the current ABCA Program by the inclusion of Australia. In 1965 New Zealand joined, using Australia as a channel.

Under the operating procedures of the current ABCA Program, TEAL meetings are now a formal part of that program. They are now held at 18-month intervals and the location is rotated among the four members. The primary aims of the meetings are spelled out as being the exchange—at the Vice Chief/Deputy Chief of Staff level, of information on national policy, concepts, and equipment; to provide the armies with opportunities to direct and guide the program; and to recommend priority areas for standardization.

The aims of the Basic Standardization Agreement of 1964 included not only achieving the fullest cooperation and collaboration but also the highest possible degree of interoperability through both materiel and non-materiel standardization, and also to obtain the greatest possible economy by the use of combined resources and effort.

The stated policies include keeping each other fully informed of R&D taking place in each other's armies and to guide R&D efforts where possible along lines compatible with requirements of the four armies. Formal agreements are kept in both materiel and non-materiel fields on items or concepts acceptable to two or more armies.

During the recent TEAL meeting the attendees received a life span run-down on the ABCA Program, the story of the past being presented by the Australians, the present by the British, and a look at the future and its implications by the Canadians. The U.S. presentation provided a wrap-up and proposals for the direction and emphasis for future ABCA cooperative efforts.

Contained in this issue are four articles based on these presentations. From these, one can see clearly the track from an obvious need, to rather remarkable and considerable progress in standardization and interoperability being made, considering the forces that are always present to counter these.

However, where in the past time permitted the trial and error evolvement of much of what has already been accomplished, that time cushion will most certainly not be present in the future. There will not be months or years to permit a slow learning of what each others' terminology means, to develop interfaces, and to provide interoperable consumable items. It must be done now.

So the editors of *Army RDA Magazine* believe it is in the best interest of its wide reader community to acquaint them with the ABCA Program. We heartily thank the authors and governments of Canada, Australia, and Great Britain for assisting us by making their presentations to the recent TEAL meeting available in the form of articles.

Interoperability: ABCA Operations Since World War II

By MG P.C. Gration

A little over 31 years ago, on 28 August 1950, the main body of the British 27th Infantry Brigade arrived at Pusan, Korea. An American band played on the quayside, a party of Korean girls sang "God save the King" and the brigade commander and other officers were presented with bouquets. Thus began the British contribution to Korea, and with it, problems of cooperation and interoperability.

Since the brigade was to work under, and be maintained by, the Americans, it was decided to change temporarily the designations of the staff in order to conform to American practice. The brigade major became S3, and the DAA and QMG performed the duties of S1 and S4.

In less than one week, the two battalions of the brigade were in action, and for the remainder of the Korean war the British Commonwealth was represented, in ever-increasing numbers, in the United Nations force.

During the early stage of the war, the 27th Brigade, renamed the 27th British Commonwealth Brigade after it was joined by an Australian Battalion, had to rely substantially upon U.S. resources for supply and movement, and for artillery, armour and air support.

It would be incorrect to pretend that problems of cooperation and interoperability did not exist. However, with goodwill on all sides, the problems were overcome and the brigade played an effective part in the advance north towards the Yalu, and then in the withdrawal south across the 38th parallel.

A major task of the British Commonwealth Armies between the two world wars had been the standardization of tactical doctrine, staff procedures, organization and equipment, and this had paid a good dividend during the Second World War. It was to pay a further dividend in Korea.

During the first year of the Korean War, a further British brigade, as well as a Canadian brigade and New Zealand, Indian and Australian units arrived, and in July 1951, these units formed the 1st Commonwealth Division.

In earlier days, the British, Australian and Canadian soldiers had been in Korea to be used as needed by a United States corps commander—large enough to be a reliable stopgap in time of emergency such as on the Imjin or at Kapyong, small enough to be in reserve during a major offensive. This was not an entirely satisfactory situation.

With the formation of the Commonwealth Division, many of the operational and logistic problems of the various Commonwealth contingents were resolved since most used common British supplies and equipment and shared tactical doctrines and methods of command.

An unexpected side effect of the formation of the Commonwealth Division was the generally stimulating effect of operating in a unique force and alongside troops of another nationality.

It is instructive to note that respective commanders of the Commonwealth Division, when questioned in later years, had no hesitation in describing the 28th Commonwealth Brigade as the best of their three brigades. Yet, the 28th Brigade was the most nationally diverse of the three brigades, with two Australian and two British battalions, an Indian field ambulance and a New Zealand artillery regiment. The necessity for working together gave them something extra.

The high degree of cooperation and interoperability within the Commonwealth Division was shown in the field of fire support. Divisional fire support was provided by British, Canadian and New Zealand artillery units, supplemented, when required, by U.S. corps resources.

Fire control procedures in common use by Commonwealth countries had been honed over a long period, were well known, and stood the test of frequent intense pressure. U.S. gunners used different procedures, and liaison officers were required to facilitate artillery co-operation following that, there were few problems.

Similarly, especially during the later stages of the war, known as the static war, there were frequent reliefs in place, involving not only Commonwealth units but also American Army units and Marines. However, to give a true perspective, although these complicated maneuvers went off without any real hitch, they were rarely carried out under intense enemy pressure.

There were other areas where interoperability could have been improved. For example, not only did the British Commonwealth and United States forces use different types of mines, but they used different procedures to mark and record minefields, and different doctrine in the employment of mines. This was a hazardous situation. Hopefully, this problem has been

eased by the adoption in recent years of QSTAG 518, Land Minefield Laying, Recording, Reporting and Marking Procedures.

Within the Commonwealth Division, only trifling difficulties arose in areas of cooperation and interoperability. The policy of standardizing organizations, equipment and methods and the system of interchanging personnel, which had existed for 40 years, had produced, in every Commonwealth country, a body of officers capable of functioning efficiently in any integrated force—whether in command or on the staff.

The main problems concerned the resupply of American ammunition, equipment and rations—used mostly by Canadian units—from outside the Commonwealth resupply system. The Indians also required special food. These variations from the norm compelled the Division to have about 120 additional vehicles.

In addition to the administrative problems created by the British Commonwealth forces requiring a separate logistic system for many items, there was difficulty with command and staff/procedures.

The focal point for allied interoperability must be a commander's staff. By necessity, staff officers need to be as informed and politically sensitive as the commanders they support.

A recent United States study shows that once the integrated portion of an allied force reaches one-third to one-half the total strength of the force, its presence will begin to be felt in all functional areas.

Problems with command and staff procedures took some time to iron out. A specific instance of misunderstanding was over patrolling policy. Not only was there some disagreement between the commander of the British Commonwealth Division and his corps commander, but there were also difficulties in procedure between some Commonwealth formations in the division.

American higher formations kept much closer control over subordinate formations than was customary in Commonwealth armies and at times this led to misunderstandings.

Near the end of 1951, MG Cassels, the commander of the Commonwealth Division, stated in a periodic report that he had had an interview with his American corps commander to resolve differences over operational doctrine. He reported that the corps commander could not have been more helpful and following the interview cooperation improved and both sides were happier. However, Cassels added: "There is no doubt that they look at military problems in a very different light to us."

If Cassels had not been able to resolve his differences with his American corps commander his directive gave him the right to appeal directly to the Commander-in-Chief, British Commonwealth Forces, Korea, who could pass the appeal to the Commonwealth Governments. However, neither Cassels nor his successor found it necessary to invoke this directive, a circumstance helped considerably by both sides making a conscious effort to understand one another's command system, and to cooperate in achieving a common and well recognized goal.

From a strictly Australian point of view, the operations within the Commonwealth Division provided the Australian Army with experience which proved valuable in later conflicts in Malaya and Vietnam. However, Australian experience was limited generally to regimental personnel up to the rank of lieutenant colonel.

The Australian Army learned little about the higher direction and complex staff work associated with allied operations in modern conventional warfare. To prevent misunderstanding on the battlefield, it is important for staff from national armies to be represented at all command levels even if the national component is relatively small.

It would have been wise for the Australian Government to have pressed for opportunities to participate in the work of higher staffs and wise for the United States and British Governments to have agreed to grant them, in the interests of fostering the military capabilities of a smaller ally. Such experience would have helped planning for allied interoperability and cooperation in the following years.

Within a few years from the Korean War, Australian, New Zealand and British forces were on operations in the Malayan emergency and a little later were involved together during confrontation with Indonesia, operating in Borneo and the Malayan peninsula. Again, working with similar organizations and with common procedures, cooperation was, as we would expect, excellent.

While certain items of equipment and ammunition were different, for example, ammunition for submachine guns, and ration scales, these differences did not hinder cooperation. Furthermore, Australian and New Zealand officers were well represented on HQ Far East Land Forces, and it worked well.

The war in Vietnam was the last occasion in which two countries of the ABCA agreement fought together. In 1965, Australia increased its commitment in Vietnam from a training team to formed units. The

(Continued on page 7)

ABCA:
Interoperability Today

By LTG Sir Thomas Morony KCB, OBE

TEAL XXIII, held this past year in Montreal, Canada, examined the state of interoperability in a ABCA force as it might be constituted "today". Today's positive atmosphere results, of course, from the efforts of countless people working throughout the ABCA "yesterdays". ABCA Armies are so firmly linked by history that operations involving all or any of them offer, in principle, few problems.

It must be stressed that in the fields of tactics, equipment and logistics, there is a need for continual effort to ensure that changing needs of the separate armies are recognized by each ABCA member and the concepts, tactical doctrine, procedures, and equipment are aligned so that they are all in sympathy. This will ensure effective cooperation during operations.

The scenarios upon which TEAL XXIII discussions were based were that "the ABCA force is part of a U.S. corps containing a U.S. armored division, air cavalry, and an airborne brigade. There is a Commonwealth Division with a joint HQ staff and it comprises U.K., Canadian and Australian brigade-level formations. The Australian formation may contain a New Zealand battle group. The force is conducting high intensity operations. There is an NBC threat."

Using the above scenario, four major fields were considered: command, control and communications; combat arms; combat support; and logistics.

Command, Control, and Communications (C^3)

Command, Control and Communications in the scenario must be extremely flexible and allow any variations in the force deployment that the commander may wish. This may include, for example, the support of the Commonwealth Division by U.S. elements or operations involving any or all of the British, Canadian and Australian brigades.

It is worth noting that interoperability is certainly not just a matter of technology or equipment, these only being aids to meeting the intent of the following NATO definition of interoperability: "The ability of systems, units or forces to provide services to and accept services from other systems units or forces and to use the services so exchanged to enable them to operate effectively together."

Effective communications are necessary for command and control. This gives a certain logic for starting with the last of the "three Cs". In a national force, it is likely that there will be standard issue communications equipments or, at least, the technical interoperability between different communications equipments will have been established.

A multinational force may not necessarily have identical communication equipment so there may be interface problems. Regardless of the situation, there will always be a great deal of information to exchange both before and during the operation on, for example, frequencies, call signs and codes. These will have to be addressed early in the planning of multinational operations.

It is also absolutely necessary that standard operating procedures and agreements be established in peacetime so that planning can proceed on a basis of mutual understanding.

Within the ABCA Armies we have, at present, quite a healthy situation. We have developed radio sets to agreed standards and we can provide VHF and HF nets using mixed equipments. This has been tested during exercises and in every case where units and formations have been transferred from one command situation to another, communications interoperability has been possible.

It is often observed that language on the Western side of the Atlantic is not the same in its usage as "English English". The same can be said of "Australian English," especially where military terms have to be clearly understood by all. There is a continual need for study and discussion so that we all mean exactly the same thing when we use a particular term.

Both the Quadripartite Working Group on Command and Control and the Quadripartite Working Group on Automation Interoperability are working towards improvement of Command and Control within an ABCA formation.

A facet of command and control is STANO (Surveillance Target Acquisition and Night Observation). The present concern is to bring together the numerous devices, intruder alarms, night goggles, weapon sights, thermal imagers, image intensifiers, and television, lasers etc.

It is recognized that an ABCA formation should field STANO equipments of matching performance at divisional and brigade levels, these being of course appropriate to the system of which the device forms a part.

Intelligence is one of the main props of command and control. Intelligence data comes from EW and STANO systems and one of the problems is to ensure that the systems are properly integrated and working harmoniously. These bring requirements for high speed, high capacity communications with automatic

data processing for handling the information.

In the field of C^3, the ABCA Working Groups have a solid record of achievement. Procedural Quadripartite Standardization Agreements (QSTAGs) have been completed and are currently in use. Concept papers have been written which guide equipment decisions and we have achieved practical interoperability in HF and VHF nets in the field. QSTAGs for STANO and C^3 equipment have been prepared which form a basis for materiel standardization.

The work of the ABCA QWGs is not all plain sailing. Achievements are not made without overcoming difficulties arising from political, military, economic, and technical considerations. Nevertheless, we can safely say that in the field of C^3 the ABCA Armies are now well placed to "interoperate".

Combat Arms

In the field of combat arms, we include infantry, armour, surface to surface artillery, and aviation components.

The combat arms of the ABCA Armies have worked together through countless engagements over the years and through exchange of personnel in schools and units as well as at staff levels in headquarters.

In the scenario given above it was found that a firm basis already exists with respect to procedural matters. Because of the preparatory work on procedural matters already accomplished by QWGs, standing operating procedures for the force could easily be prepared on: mechanized infantry operations; coordination of fire between flanking units; tactical handling of small units; military operations in limited visibility; air mobile/air assault operations; capabilities & employment of snipers; anti-armour defence; rules of engagement; artillery command & control; formats & procedures for fire plans; fire coordination in support of land forces; procedures for airspace control; air defence suppression for helicopter operations; and helicopter cross servicing. Thus, the force has a firm basis for effective interoperability and, moreover, a firm basis for improvement of procedures as operations develop.

Non-standard equipment in the combat arms pose more difficult problems. Possibilities for cooperative R&D of equipment have been given a great deal of consideration but there remain a variety of tanks, guns, different anti-tank weapons, vehicles, helicopters and small arms.

ABCA Armies have a great understanding of the problems involved in materiel standardization, but have not achieved entirely compatible or interchangeable equipment. Military equipment today is expensive and is an important consideration in the budget of any country be it producer or buyer.

In armoured units throughout ABCA, we have a good mix of armour and anit-armour munitions. While this is an advantage in that it gives the enemy more to think about, it means for our own forces that they are dependent on unbroken lines of communication to several sources of supply. This naturally may lead to constraints and inflexibility.

With artillery, the picture is better since we would have only two calibres of gun in the ABCA force. The artillery ammunition is interchangeable and so the re-supply problem for artillery ammunition is simpler!

Small arms ammunition has at the time of writing not yet been standardized—the weapons themselves are not so important, but we hope in the near future to establish new standards as a result of the recent NATO Small Arms Trials. Relative to mortars, the picture is good. The 81mm mortar calibre is standard; with interchangeability of ammunition complete.

Combat Support

In the field of combat support we consider: air defence artillery, engineers, aviation/components, and NBC defence.

Brigade level air defence is provided by very low level missiles like BLOWPIPE and Redeye. Low level is provided by systems of the Rapier class and gun systems in both brigade and divisional areas. Defence against medium or high altitude targets would be done by U.S. Corps or by the Air Force in support of the ground forces.

The fact that the ABCA Armies operate different types of weapon systems is not, by itself, a great difficulty from the operational point of view, except that logistic problems are aggravated.

Communications interoperability is important for early warning and command and control. Communications must extend to specialist air defence units as well as to other units and installations, and IFF equipment must be interoperable.

Relative to the engineers in the Commonwealth Division, we would expect to find a U.K. or Australian field squadron or a Canadian combat engineer regiment. These units would probably be kept intact and in support of their own brigade level formations. The joint engineer planning staff should coordinate and task engineer resources for combat engineer and construction tasks outside as required by the divisional commander.

A more detailed discussion of engineer functions is in order at this point. In the area of mobility, interoperability has been achieved mainly in relation to procedural matters. This is a continuing trend. Current agreements cover the documentation of many types of engineer information such as use of mines, gap and obstacle crossing and techniques for determining the load classification of civilian bridges.

In bridging, there has been the successful completion of an agreement on the Medium Girder Bridge (MGB) from the exchange of requirements documents through the ABCA commenting procedures.

Counter mobility achievements have been made in the area of con-

trol of reserved demolitions and the interchangeability of explosives. ABCA is tackling the problems posed by scatterable mines which are now well to the fore in military thinking as "instant" minefields where and when they are wanted.

Engineer command and control is rather specialized and formats for reporting engineer information have been agreed to for the documentation of engineer intelligence on roads, bridges, beaches and inland hydrography. Agreements exist or are being prepared on land minefield recording and reporting, mapping, charting, and geodesy.

Army aviation efforts are directed at providing integral rotary and fixed wing vehicles for support of the ABCA Corps. Currently, a high degree of standardization exists between Australia the United States and Canada in their use of the BELL 206 Helicopter. The U.K. would operate Gazelle.

The Australian contingent would also have to be given other rotary wing aircraft from the general corps or divisional resources. A basic difference in the philosophy of operating aviation in direct support of the ground forces is "which Service flies which aircraft"? The desirability of a single body/single Service dealing with helicopter operations in the land battle is recognized and would certainly alleviate interoperability problems generally.

There is a high degree of procedural and equipment NBC defence interoperability between the ABCA Armies as a result of many years of effort by the Quadripartite Working Group on Nuclear, Biological, and Chemical Defence. Only one of the Armies (the U.S. Army) has a specialist Chemical Corps.

Defence against NBC is largely protection of the individual as opposed to protection of equipment though nuclear weapon effects on equipment have to be considered.

An NBC operations cell could be manned by taking personnel from any of the Armies' contingents and the documentation and training already accomplished would allow the cell to operate effectively: to provide advice and assistance to commanders and staffs; to receive, evaluate and disseminate reports; to assess the effects of NBC attack on operations; to plan NBC defence operations; and to coordinate the effective use of resources.

Logistics

It is quite apparent that interoperability between forces will be, to a very considerable extent, dependent on the arrangements made for mutual logistic support. ABCA Armies have recognized this and have established the following concepts as a basis for mutual administrative support:

Units and formations will group their logistics elements into administrative areas for command and control.

A minimum of supplies will be held in the combat area to avoid losses. Rations, fuel, and ammunition will be delivered to units through predetermined distribution points.

The basic mode of transportation will be land transport. Units will have organic transport for their immediate requirements. The marking of military cargo has been standardized (QSTAG 590) and there a number of agreements on transport support.

Progress is being made relative to maintenance and recovery, in the preparation of agreements on Repair/Recovery (QSTAG 171) and Maintenance Requirements (QSTAG 656). Consideration is being given to sharing facilities, pools of replacement equipment, and mutual maintenance support of common equipment. Also under review is the establishment of common technology, agreed classifications of serviceability/readiness, and common requisitioning procedures.

Miscellaneous logistic services, such as baths, laundry, and postal services are provided in the combat zone but at an austere level. Full support will be provided in rear areas.

Construction of facilities in the combat zone will only be at the minimum level to sustain operations. This is a somewhat difficult area to deal with since national facilities have developed from cooperation between national civil and military authorities and modifying them is not easy.

The Quadripartite Working Group on Logistics (QWG/LOG) has applied these concepts to identify areas where special efforts are needed to enhance interoperability. An understanding of each Armies' logistic systems is essential. This understanding is aided by *The ABCA Armies Logistic Handbook*—procedures for mutual support, and *The Catalogue of Combat Supplies*—a catalogue of critical items.

One major field to be tackled is the exchange of goods and services. No mechanism exists at present for exchange of goods and services in both peace and war. ABCA would prefer a single procedure covering all services rather than the piecemeal ad hoc arrangements which have to be made up now.

LTG SIR THOMAS MORONY KCB, OBE is Vice Chief of Staff of the General Staff, United Kingdom Army. Educated at Eton, he enlisted in the Royal Artillery in September 1945, was granted an emergency commission in 1947, and was granted a regular commission in the Royal Regiment of Artillery in 1948.

ABCA Operations Since WWII

(Continued from page 3)

first Australian battalion to arrive became part of the U.S. 173rd Airborn Brigade and operated around the Bien Hoa air base.

The Australian battalion's operating procedures differed markedly from those of the formation it had joined. For example, the Australians had been inculcated with the idea that counter insurgency operations would take a long time and that there was no point in hurrying the process, that it should be done deliberately and carefully.

Another difference was in concepts of artillery fire support. As was the usual practice, American NCOs were deployed forward as fire controllers, and the only officer from an American artillery battalion with the Australian battalion headquarters was a lieutenant. He could never stand in the same relationship to an Australian commanding officer as does the Australian battery commander, a major.

Problems with artillery fire support were minor and were soon resolved. Early, during the Vietnam War, Australia adopted QSTAG 225, "call for fire format", and although U.S. procedures were slightly different, the Australians had little difficulty in conforming to U.S. procedures when U.S. guns were being used. However, it took longer for the Australians to learn about the use of helicopter fire support.

Terminology was a bit of a problem, and soon after the battalion arrived, the commanding officer sent the signals sergeant down to the brigade command post as an interpreter. During combined operations it was important to provide liaison officers to avoid misunderstanding.

Australians had to learn to call 'LZEDS', 'LZEES' and that there were 'ROWTS' not 'ROUTES'. The Australians also learned about 'frag orders' and planning conferences, rather than 'O Groups'.

These initial problems would have been far worse were it not for a number of factors. First, in the early 1960's Australia had started to break away from traditional British systems and had embarked on a substantial reequipment programme, experimenting with what were, to Australia, radically new organizations and training.

New equipment came from a variety of sources, with much of it being American. For example, Australia used mainly American radio equipment, and with slight changes to voice procedure, signals interoperability was quite effective.

Second, in 1964, Australia signed the basic standardization agreement and, in so doing, accepted many of the existing standards. For example, Australia accepted QSTAGs on the 105mm towed howitzer and the 81mm mortar, in both cases including ammunition. Since both weapons were used in Vietnam, resupply was simplified.

In a similar vein, the adoption of the American M113 armoured personnel carrier meant that spare parts were available through U.S. supply systems. Spares for the Australian main battle tank at that time, the Centurion, had to be sent specially from Australia.

Australian infantry adopted the U.S. M16 carbine as a replacement for the Australian FI sub-machine gun thus easing ammunition resupply, but the Australians still had to have special resupply arrangements for the main infantry rifle, the 7.62mm SLR. Although these differences did not cause major problems, it did make the resupply system less flexible.

Eventually, the Australian force was built up from one battalion to a three battalion task force operating under the operational control of the U.S. Commander 2 Field Force (Vietnam).

Although the task force was responsible for Phuoc Tuy Province, and generally operated within this allotted area of operations, it had U.S. artillery and aviation elements attached permanently and took part in several combined operations with U.S. forces, including security of the eastern approaches to Long Binh during the 1968 Tet offensive.

Our use of U.S. offensive air support merits mention. Virtually every method was employed, from U.S. forward air controllers, through Australian FACs and often by emergency call using no FACs at all.

Despite certain procedural differences, the process worked, with target sighted and ordnance delivered when required. Of particular note was the very high level of cooperation the 1st Australian Task Force units enjoyed with U.S. gunships and medevac dustoffs. Their support was called for—and given—by day and by night in all forms of terrain and vegetation from the thickest of jungle to open country.

Not so dramatic, but equally vital, were the logistic support arrangements. The commanding officer of the first Australian battalion into Vietnam recalled that generally the American supply system was capable of coping with any of the peculiar demands that his foreign unit might have put on them. Nonetheless, in those areas, greater standardization would have made the Australians a little less of a burden on the system.

As the Australian force grew, the vast majority of logistic tonnages

came from U.S. sources in theatre, often delivered direct from U.S. facilities to units in the field. Once Australian units and staffs had become familiar with U.S. leadtime requirements, there were few if any procedural problems that inhibited supply. The QSTAGs mentioned earlier, covering gun and mortar ammunition, were extremely important in simplifying the logistic problem.

With respect to food, initially it was expected that Australian troops would subsist entirely on United States Army rations, but differing national tastes had not been taken into account. Although the United States combat ration pack was at first very popular, Australian troops soon began to ask for the Australian ration.

Apart from the problem of taste, the Australians also found that the American rations were too heavy and bulky to carry on protracted patrols, probably reflecting different patrol doctrine.

It should be added that New Zealand forces were integrated into the 1st Australian Task Force providing an artillery battery and two infantry companies. These sub units were integrated into Australian units.

In all these areas of cooperation and interoperability it was not that problems did not exist—of course they did. However, pressures of combat soon ironed out the differences in formats and procedures, and throughout the period in Vietnam, the Australians achieved high levels of cooperation and interoperability with U.S. Forces.

Although the ABCA Armies have not fought together since Vietnam, it is interesting to observe that the deputy commander of the Rhodesian monitoring force, from December 1979 to March 1980, listed as one of the lessons from that operation that ease with which the Commonwealth Armies involved could merge together and work as one—a commentary on the practical application of interoperability.

From the experience of combat over the last 30 years we can conclude that in Korea and Malaya years of combined training and standardization in the British Commonwealth countries paid good dividends. Yet, even within Commonwealth forces some differences had to be resolved.

In Korea, the formation of the Commonwealth Division helped to isolate and then resolve operational and logistic problems, and the integration of several nationalities had a stimulating effect on the units involved.

Changes in doctrine and equipment in the Australian Army in the early 1960's made it easier to achieve cooperation and interoperability in Vietnam. Nonetheless, in all the wars, command and staff procedures often proved to be an area of major difficulty, at least in the initial stages.

Much of the success in combined operations was achieved through necessity after trial and error during combat over an extended period of time. This success occurred in limited wars which allowed time for this cooperation to develop.

The lesson appears to be that years of combined training and standardization in peace are essential if there is to be rapid, effective battlefield cooperation and interoperability.

Levels of standardization achieved in the British Commonwealth countries in Korea and Malaya are unlikely to be achieved in future circumstances, should the ABCA nations be called upon to operate together. Despite this, although national forces might use different equipment and internal operational doctrine, allied cooperation and interoperability can be improved substantially if there is an agreed philosophy on command and control of allied formations. This would be assisted if commanders and staffs were exercised in controlling units which might have different operational systems.

In the future, ABCA Armies will not be able to rely on a period of relative operational inactivity at the beginning of a conflict to develop the required cooperation and familiarity with each other's system.

Problems of operating with allies require command and staff awareness of such problems, and detailed planning to meet them. The fundamental lesson from past experience is the need to plan, train and organize now for allied interoperability. There may be no time to do so on the battlefields of the future.

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Changes on Tomorrow's Battlefield & Their Implications for ABCA Cooperation

By MG Patrick J. Mitchell

Today, attempts to predict technological innovations that will change the way wars are fought are made frequently by scientists, soldiers and laymen alike. Magazines publish the speculations and individuals and international agencies establish committees to ensure that no foreseeable technological advance remains unidentified. Even the ABCA organization itself indulges in this 20th century form of crystal-ball-gazing.

It is very difficult to assess the real value of all this scientific prognostication since the validity of current forecasts can only be finally established at some time well into the future. It is therefore of interest to find out something about the accuracy of forecasts made long ago.

A British study undertaken in 1937, to cite but one, on technological trends and national policy, managed to overlook "helicopters, jet engines, nuclear weapons, electronic computers, inertial navigation systems and rocket powered missiles, all of which were operational within 20 years and the majority within a decade."

Although our forecasting abilities may be imperfect, the ABCA Armies consider the technological future not only to ensure that technological surprise is minimized, but also to ensure that national trends in equipment development and doctrine do not become so diverse that interoperability is seriously compromised. It is not hard to find examples where interoperability could be badly compromised within the next five years as a result of divergent national development trends and other technological factors.

Advantages which technology can offer through automation in command and control systems will only be fully achieved in a multi-national force if common message formats are adopted. An increasing diversity in tank guns and ammunition will create substantial logistic interoperability problems. Also, there will be obvious problems unless nationally developed laser designators and laser-guided weapons are designed to be mutually compatible. Problems such as these are normally recognized in the ABCA organization or in international cooperative research organizations before equipment is brought into service.

The future seems to hold the potential for rapid multiplication of the number of technology-related interoperability problems. While it may be true that the technological barriers to interoperability up to the year 1986 are now fairly well appreciated and under control, it is less certain that the same can be said in relation to what may happen technologically in a 20 as opposed to a 5-year timeframe.

Since there are so many studies, it is easy to conclude that everything that could possibly be said on the technological future—from improved nutrition of the soldier to the latest in beam weapons—has already been said. However, if one reads a number of them, one is tempted to conclude that they fail to provide valuable guidance be-

cause they try to say everything. For example, one study that the author read discussed the future self-propelled gun. It forecast that:

• improved propellants may result in an increase in effective range.

• electromagnetic propulsion may replace chemical propellants.

• possibly, liquid propellants will be successfully applied.

• other things being equal, improved muzzle brakes will permit lighter trunnions and reduced recoil system mass—hence lower vehicle all-up weights will be possible.

• barrel heating problems may be alleviated by use of cooler-burning propellants and/or by the use of charge additives and/or by the use of bore surface coatings and/or by the use of fluid injection into the bore and chamber and/or by the use of circulatory water cooling from the main engines of the vehicle.

• combustible cartridge cases may be more widely utilized.

• new methods of charge ignition are likely (four different new techniques were suggested).

• these methods of ignition may mean that automated loading of igniter tubes may become unnecessary.

• multi-role fuzes, automatically set, may be introduced.

• change zoning may be automated.

• automated laying systems will reduce errors. . . etc., etc., etc.

We can stop at this point, but the reader will realize that we have hardly gotten into the meat of this forecast. We still have to come to the improvements in vehicle mobility, in NBC protection, in ammunition resupply, in target acquisition, in artillery command and control—and the bewildering range of new technological options for the munitions that these wonderfully improved guns are going to project.

We haven't yet considered the range of possibilities for improved artillery rockets or mortars—or even begun to recognize that armies do not consist of gunners alone!

The problem that this example illustrates is that the range of potential and probable advances in military equipments is very wide indeed. Documented forecasts are made by committees of specialists. They each see several, no doubt valid, potential advances in their own area of expertise but it is easy to recognize that a lot of these improvements, while real, are not going to be earth-shaking in their impact. Many of them are also likely to offset each other on the battlefield. For example, if the ballistics experts improve the penetration performance of armour-piercing rounds by 50 percent and at the same time the armor experts improve the protection against such rounds by 49 percent each group of experts could legitimately claim to have made a substantial technological advance. However, neither would have had much impact on the conduct of tank battles in the next war—assuming of course that our potential enemy achieved much the same degree of technological success as ourselves.

This is an important assumption and if either side were to neglect one of these two areas of technology it would be left at a very serious disadvantage. However, it is a very reasonable assumption provided both sides maintain comparable levels of overall technological effort. Experience has shown that it is not long after a technological innovation is introduced on one side of the Iron Curtain that it appears also on the other.

Of all the foreseen technological innovations however, there are going to be a few that are not likely to be counter-balanced, at least for a significant period of time, by corresponding innovations on the other side of the technological coin.

All of this suggests that there is a need for two kinds of technology forecast, both important. The first kind, the kind we usually do quite thoroughly now, addresses the problem of identifying all the potential advances, major and minor, in military technology. There are long lists of such advances in the NATO L02000 studies and other such places.

The second kind of forecast seeks to identify from amongst these lengthy lists those few areas where technological counter-advances are not likely for a substantial period of time. These are the revolutionary technological advances that may give enormous advantage to the side that first brings them to fruition. They may require a reorientation in thinking about force structures, about tactics and about training if we are to exploit them fully. If the enemy should employ them first, an even more drastic reorientation of our armies could be absolutely vital to their survival.

We in Canada devote little organized effort to trying to make early identification of such revolutionary technologies and in some of the other ABCA countries there may perhaps be a similar reliance on semi-intuitive perception of impending technology threats. Perhaps only in the U.S., through agencies such as DARPA, is there a major investment in the search for the exploitation of critical new technologies.

In general, military technology progresses by investigating, at the exploratory technology end, a large number of options which, through analysis and experiment, are gradually reduced in number until only one or two find their way into pro-

duction. The weeding-out process becomes progressively more stringent as the costs rise from the relatively cheap exploratory stages toward the expensive engineering development and test stages.

This time-honoured process of starting with a wide range of studies and gradually reducing the number of options—or, if you prefer, developing a technological strategy—is one that each of our countries now follows and it is one which no sensible person would wish to change in its essentials. However, since the number of conceivable systems that technology makes possible is increasing and since the costs of development and production are rising, it will become increasingly necessary as the year 2000 approaches to start the weeding-out process at an earlier stage than we now do and to develop our strategy for the application of technology with greater care than ever before.

Technological strategy is something that traditionally is predominantly national concern. International organizations of allied armies have only become concerned with a few critical parameters, often at relatively late stages in the process from conception of a system to its introduction into the field.

Interoperability has been ensured by international specifications for critical components that have to interface between formations of different nationalities. Interoperability has also been greatly aided by the need for the smaller nations to buy much of their equipment from allies, rather than independently develop their own.

As just one example of the kind of technological strategy question that might be collectively addressed, consider the future tank. New anti-tank systems of high precision, including means for attacking the top and belly of the vehicle, seem likely to demand extra armour protection in the tank of the future. Other things being equal, this increases all-up weight and reduces mobility. Following this line of reasoning we can expect that the main battle tank 25 years hence will be more ponderous, more expensive, more easily bogged-down and more easily detected than its counterpart.

A writer in the August 1981 issue of *Scientific American* goes so far as to predict that the tank "will then be relegated to a largely ceremonial role, being put on display in Russian May Day and American Memorial Day Celebrations."

If the choice between these two technological strategies is a purely national one, several outcomes are possible. The two tank-producing ABCA nations may each elect to develop one type of tank only—perhaps both nations would choose the same strategy or perhaps they would take opposite courses.

The first option would leave a joint force without the flexibility that might exist if both types of vehicles were available and it would seem to involve wasteful duplication of development effort. The second alternative creates significant impediments to interoperability. It must lead to an almost complete lack of interchangeability of spare parts. The guns would almost certainly be of different calibre so ammunition supply arrangements would have to be duplicated. Maintenance crews would probably not be interchangeable without special training. Also, a host of other such difficulties might arise if communications systems and command and control philosophy had also followed independent paths.

Perhaps worst of all, we can conceive of the possibility that the two tanks could require different kinds of fuel. If both nations were to proceed developing both types of tanks all these last-named disadvantages would be compounded by further probable wasteful duplication of development effort.

The advantages and disadvantages of the various development possibilities are not easy to assess. However, it would seem worthwhile to address, collectively, the pros and cons of long-range technological strategy and try to arrive at the most advantageous situation for all the armies by a process of collective debates and logical argument rather than through independent and uncoordinated national decisions.

Somehow we need to have cooperative arrangements that will result in avoiding unnecessary duplication and unnecessary impedients to interoperability, without hampering exploration of technological options and without infringing on national sensitivities.

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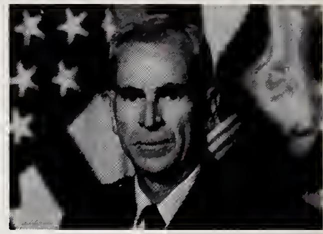
The ABCA Armies: The Challenge of Coalition Warfare

By GEN John W. Vessey



In October 1981, I had the privilege of heading the U.S. Army delegation to TEAL XXIII in Montreal, Canada. This 23rd conference on standardization, attended by the Australian, British, Canadian, New Zealand, and United States Armies, the so-called ABCA Armies, was important in focusing attention on the needs of coalition warfare.

Coalition warfare is not new to the ABCA Armies. In World War II we fought together in many different theaters of war and under a wide variety of climatic and terrain conditions, and we won great victories.

Cooperation was a learning experience for all the armies because we had vast differences to overcome. We ate different rations, had different customs and habits, and even occasionally had difficulty understanding each other because we spoke different "brands" of English. We had much to learn—and very quickly—about how to lead and fight our own units, as well as how to work together as allies.

All the English-speaking allies developed and fielded countless new weapons of all types during the war—and the progress of weapons technology was staggering. In the air, the allies went virtually from biplanes to jets and on the ground, from 15-ton to 45-ton tanks and from 37mm to 90mm antitank guns. Absorbing the rapid technological growth was a training and a logistical burden, and those burdens had to be borne in combat. Time, or lack of it, was one of the greatest problems.

The success of allied operations could not have been achieved without extraordinary cooperation among the allies. We had to master our different operation methods, tactics, logistics, and staff procedures very quickly. We would have been far more efficient if the planning and training had taken place before the war.

My own experience in World War II impressed me with the importance of planning for coalition warfare. In the first months of the Tunisian Campaign, we found ourselves armed with British 25-pounder howitzers, and operating under the command of a British task force.

Operational planning and logistic support often crossed national lines, and the need for multi-national understanding was usually heightened in time of crises. A little planning and training in peacetime would have paid great dividends.

A desire to capitalize on past experience led to the establishment of the original form of the ABCA Standardization Program in 1947. Principal objectives were then, as they are now, to insure the fullest cooperation and collaboration among the ABCA Armies, to achieve the highest degree of interoperability among our forces, and to make economic use of combined resources and effort.

The Korean War in the early 1950's, again, found the armies cooperating on the battlefield. The British Commonwealth Division, consisting of British, Canadian, Australian and New Zealand units, served under a U.S. Corps headquarters. There were, again, logistics and procedural differences, but the lessons of World War II and the former ABCA cooperation paid dividends.

In Vietnam, American, Australian and New Zealand units again cooperated. Again we had some differences, but the ABCA cooperation through the years eased the problems.

Combat experiences in major conflicts have forged strong bonds among the ABCA Armies. We must not allow peacetime complacency or the passage of time to blot out the lessons of the past. Attention needs to be given to the practical aspects of fighting together—moving, shooting, and communicating within a combined force. For that reason, I was pleased with the work accomplished in Montreal at TEAL XXIII.

The Theme of TEAL XXIII—"Yesterday, Today and Tomorrow"—provided the opportunity to reflect on just how important it is to plan for coalition warfare to be able to meet the emergencies that might confront us.

The collective examination of the requirements for coalition warfare resulted in the following conclusions:

- We have succeeded in operating together in the past in general war, limited war and counterinsurgency operations—but often with difficult recurring problems.
- Our interoperability difficulties can be broken down into near-term and long-term challenges in both materiel and non-materiel fields.
- A balanced approach must be taken to cope with different kinds of conflict—emphasis is needed on lower intensity warfare as well as higher intensity scenarios.
- We will not have time to sort out serious interoperability problems in future warfare requiring combined operations.
- Collaborative training, combined exercises and unit exchanges provide some of the best means to identify our interoperability problems and to chart corrective actions.
- All of the armies need to pursue TEAL-designated priority areas for standardization and interoperability.
- Command, Control and Communication (C^3) Systems and ADP Systems are areas requiring our collective best work to ensure future interoperability.
- Greater emphasis is required to study and meet the threat imposed by sustained operations (fatigue, stress casualties).

In broad perspective, we agreed that greater emphasis should be placed on learning and practicing interoperability through the use of combined exercises, unit exchanges and exchanges of personnel. We should also focus on concepts for multi-regional, lower intensity conflict contingencies.

Additionally, efforts should be channeled toward high priority, long-term materiel standardization and should streamline our administration to the maximum extent possible through efficient use of ABCA-dedicated resources to pursue near-term enhancements to materiel standardization.

We also agreed at TEAL XXIII that a philosophy of "readiness to operate together" should drive day-to-day business of the program. The theme of TEAL XXIV will be "Coalition Warfare—2000". The conference will be held at West Point in the spring of 1983 and will focus on the requirements of the coalition to the end of this century.

The ABCA Program, born of the coalition of World War II, is now shaping itself to contend with contemporary and foreseeable threats and contingencies. Its machinery is being streamlined to focus on priority needs and to divide the work logically and efficiently.

The ABCA Armies have the tremendous advantages of mutual interests, common language, and decades of experience in working together. We need to capitalize on those advantages by planning carefully for future cooperation.

TEAL conferences are attended by the Vice Chiefs of Staff of the ABCA Armies, a strong indication of the importance each army attaches to the effort. At TEAL XXIII, I pledged, as my predecessors have, that the U.S. Army will continue to support cooperation with the ABCA Armies. The Army Staff and the operating commands have received instructions to carry out that pledge with renewed vigor. Coalition warfare will be effective only if we plan and train for it.

The ABCA Standardization Program

By LTC Stuart K. Purks

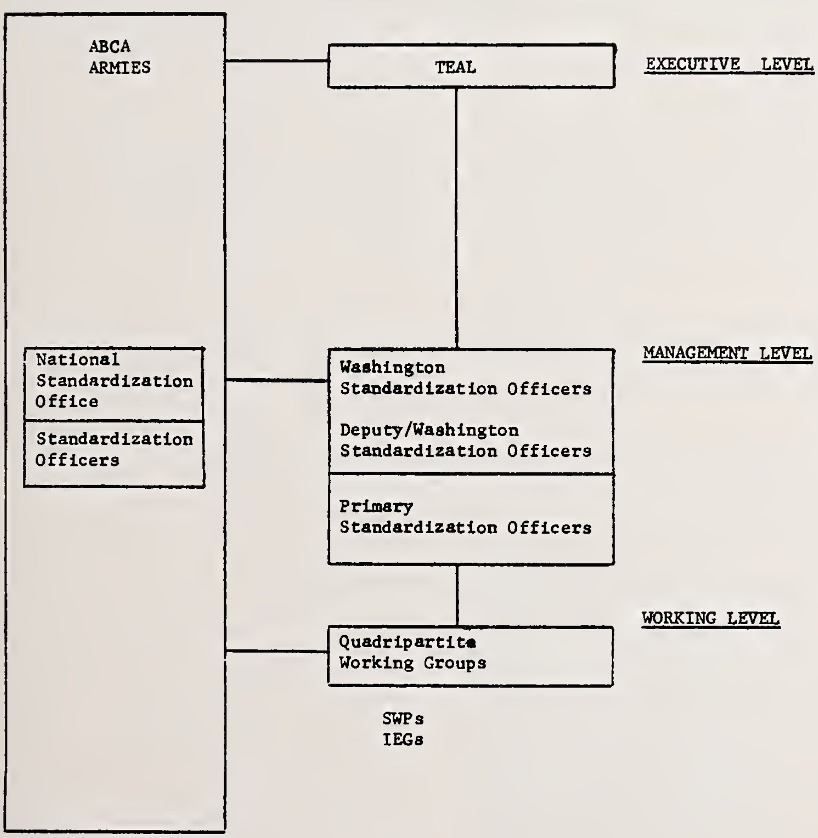
"It is wasteful in the extreme for friendly allies to consume talent and money in solving problems that their friends have already solved—all because of artificial barriers to sharing. We cannot afford to cut ourselves off from the brilliant talents and minds of scientists in friendly countries. The task ahead will be hard enough without handcuffs of our own making."

President Dwight D. Eisenhower summed up the importance of standardization programs in this quote during his State of the Union Message in 1958, and that statement is probably as relevant today as it was in 1958. The rapid changes in technology caused by new developments in all nations require close coordination to pull the "brilliant talents and minds of scientists of friendly countries" together.

The American, British, Canadian and Australian Standardization Program is striving to overcome the "artificial barriers" by carefully organizing the program resources to provide maximum benefit to armies.

Other articles in this issue have traced the historical background that lead to the eventual establishment in 1964 of the so-called Basic Standardization Agreement.

ABCA ORGANIZATION



The Basic Standardization Agreement of 1964 (BSA 1964) establishes aims for the Program which are directed towards:

- Ensuring the fullest cooperation and collaboration among the subscribing armies.
- Achieving the highest possible degree of interoperability through materiel and non-materiel standardization.
- Obtaining the greatest possible enonomy by the use of combined resources and efforts.

The free and timely exchange of information on matters of interest to the four armies has proven to be the key to achieving standardization under the agreement. This exchange is achieved through the circulation of appropriate conceptual papers, studies and national development documents and also during discussion within the 20 Quadripartite Working Groups (QWGs) which meet on 18-month cycles.

By commenting on each other's projects, the armies provide constructive criticism which can enhance interoperability, as well as declare the degree of their interest in the project. Armies that express the desire are granted access to information on all future developments on the project. Of course, this access is governed by national policies for disclosure of information. At the appropriate stage of development, an interested army may request the loan of the equipment for its own test and evaluation.

The BSA 1964 provides for a quadrilateral organization to manage the ABCA Program and this organization will be discussed in detail later. First, it is important to note that armies control the ABCA Standardization Program in that all recommendations or agreements must be formally endorsed or ratified.

Each Army has established, in its headquarters, a National Standardization Office which has the responsibility to coordinate the activities of the program nationally. Additionally, armies appoint standardization representatives in the capitol cities of the other three countries. These representatives are accredited or attached to host armies agencies and their primary function is to coordinate the bilateral activities between the separate armies.

Armies provide executive level direction to the program through the quadripartite standardization discussion, nicknamed TEAL.

The Washington based management-level organization that oversees the ABCA program is the Washington Standardization Officers (WSO). Each of the four nations nominates a senior officer, on duty in Washington, as its representative, to provide the top echelon of management, meeting as required to coordinate and expedite the program. The present WSOs are: United States—MG Stan R. Sheridan, Assistant Deputy Chief of Staff for Research, Development and Acquisition for International Programs, HQDA; United Kingdom—MG T.A. Boam, British Military Attache (Washington); Canada—BGEN J.J. Barrett, Canadian Forces Military Attache (Washington); and Australia—BRIG D.M. Butler, Australian Army Attache (Washington).

Deputy WSOs are members of the WSO staff with primary duties to attend meetings as backup and conduct special studies as directed. The WSOs are supported by a full time organization known as the Primary Standardization Office (PSO). This office was formed to provide the day-to-day administration and management of the quadrilateral program functions, and is staffed by four lieutenant colonels, one from each army, one Australian Major, a British civil servant, a Canadian Master Warrant Officer, and two American secretaries.

Being responsible to the WSO for keeping the program under continuous review, acting as the office of record for the program, monitoring the work of QWGs, as well as providing the secretariat for WSO meetings and TEAL conferences, is the job of the PSO.

Functional elements of the quadrilateral standardization effort are the 20 Quadripartite Working Groups who meet each 18 months in each country, in turn. These working groups are: Air Defense, Armor, Army Operational Research, Automation Interoperability, Aviation, Collaborative Training, Combat Communications, Combat Development, Command & Control, Electrical Power Sources, Electronic Warfare, Engineering Standardization, Engineers, Health Service Support, Infantry, Logistics, Nuclear, Biological and Chemical Defense, Proofing, Inspection and Quality Assurance, Surface-to-Surface Artillery, and Surveillance, Target Acquisition and Night Observation.

MG Stan R. Sheridan *(United States)* **MG M.S. Gray** *(United Kingdom)* **BG J.J. Barret** *(Canada)* **BRIG D.M. Butler** *(Australia)*

This photograph was presented to TEAL XXIII to symbolize the team spirit of the Washington-based managers of the American, British, Canadian and Australian Standardization Program. As with any top team, organization and team spirit is vital to the accomplishment of this Program's objectives of interoperability and standardization among our Armies.

These working groups cover the field, ranging from the development of long-term operational concepts, through operational analysis, to common and related material requirements. Armies nominate points of contact for QWGs and these officers coordinate the delegates who attend QWG meetings as members. These national experts present their army's position to the meeting, and they are responsible for reconciling differences during the discussion in order for the meeting to reach a quadripartite agreement.

The aim of a QWG meeting is to recommend definitive actions which, subject to armies' approval, promote standardization. Additionally, the QWGs are tasked by the Program Standing Operating Procedures to:

- Originate and finalize standardization agreements.
- Identify areas suitable for cooperation.
- Influence requirements by advising armies of the impact on interoperability of national decisions.
- Develop agreed concepts.
- Exchange information.
- Maintain standardization already achieved.

An important aspect of QWGs' duties is coordination with other NATO and ABCA Standardization Programs. The aim of the coordination is to reduce

duplication of effort and to ensure that one program complements the other. The coordination is achieved through cross briefings between the QWGs, NATO and the other services standardization programs that have similar interests and the close monitoring of the program activities by armies.

The briefers are normally delegates that attend both program meetings, however, occasionally the host army is requested to provide a briefer. To assist in preventing duplication and possible conflict among programs, armies review draft agreements to ensure compatibility with international agreements that are already ratified. The armies also brief delegates on national activities in other programs, thus ensuring that a common thread runs throughout all standardization programs.

The ABCA Program provides armies with the opportunity to further their common interest and its cost is very small in relation to the infinite benefits it offers. One of these benefits is that armies have access to information on more than 800 R&D projects of which nearly 300 are in the field of research. They receive periodic updates on the projects, and they can request additional information on those projects of particular interest.

Cooperative R&D projects have been agreed by armies on items such as: the U.S. Cannon Launched Guided Projectile (Copperhead); the U.K. Battlefield Artillery Target Engagement System (BATES); the Canadian Land Weapon Simulators, and Australian Leopard Tank-Turret Interaction Crew Simulator.

In addition to the projects on the standardization list, some 500 agreements have been developed which assist in achieving interoperability among the armies. Agreements reached in this program cover a wide range of materiel and non-materiel areas. Examples of these agreements include standards for ammunition, engineering practices and procedures, and call for fire procedures for artillery. Force SOPs are also under development for command and control studies.

The loan of equipment for test and evaluation is a very active part of the program. The testing of equipment by another Army allows a fresh look because the tests are objective and often use different test methods and standards. They are proving to be beneficial to the developing army as well as the interested and testing armies. Results of the tests are exchanged for consideration and further bilateral discussion. Examples of the benefits of this process are presented in COL Glock's article, "ABCA Near-Term Materiel Cooperation."

The agreement of concepts, standards and procedures, as well as the loan of equipment are some of the tangible benefits of the program. Not so apparent, and nearly impossible to assess, is the valuable advice, comments and exchange of ideas resulting from the discussions among national experts during the meetings.

This exchange of ideas often continues for months after the national delegates have returned home. These ongoing discussions were highlighted when, during the discussions at QWG/Engineers, the U.S. delegation announced that they were reviewing the requirement for the bridge boat.

After reviewing the new U.S. requirement, it was determined that a U.K. boat was very near the requirement. Subsequent discussions and the loan of boats to the U.S., for test, resulted in the decision by the U.S. Army to purchase the U.K. boat to meet the U.S. requirement.

An important ingredient of the BSA 1964 was an agreed operational concept which is designed to provide broad guidance to all areas of military discipline in the program. It was agreed that the concept would cover the period 10 years ahead and that it would be reviewed and issued every five years. The most recent operational concept, entitled, The ABCA Armies Combat Development (CD) Guide 2000, was published in January 1981, and covers the period to the year 2000.

Contained within the CD Guide are quadripartite objectives which provide a statement of desired military capability. It is from this guide, and the stated capabilities, that QWGs develop the concept papers for their areas of interest.

Concept papers reflect quadripartite thought in the timeframe designated by the CD Guide. They are intended to provide a means whereby materiel and non-materiel requirements can be aligned at the conceptual stage of development. At present, there are 100 agreed concept papers and about 100 draft, or working papers, that are being circulated by armies.

During the last century, experience has demonstrated the need for standardization among the ABCA Armies. Designers of the original Basic Standardization Agreement clearly recognized this need and provided armies with a program designed to foster greater interoperability through standardization.

The BSA is not restrictive in its organizational design because it allows the WSO the latitute to reorganize the working level of the program as necessary to meet the ever-changing needs of the program.

As new areas are identified for interoperability or standardization, such as in the case of automation, the WSO, with the approval of armies, can develop plans and activities to address these new requirements. The BSA also gives the WSO authority to disband QWGs when they are no longer required.

The ABCA Standardization Program organization provides the mechanism for the mutual exchange of information and the development opportunities for cooperative, collaborative and interdependent research and development. This organization provides the platform for face-to-face discussions among professionals who are working toward a common goal. The quality of the product and the outcome of the work toward this goal depend on the will and sincerity of these professionals and the armies that they represent.

LTC STUART K. PURKS is the U.S. Army member to the ABCA Standardization Programs, Primary Standardization Office. He holds a BA degree in business administration from Park College and an MS degree in administration from the University of Southern California. He previously served in international R&D assignments at HQ DARCOM and in a variety of command and staff assignments as an aviator and infantryman.

ABCA Near-Term Materiel Cooperation

By COL Howard G. Glock

The history of the genesis and development of the ABCA Program has been discussed in detail in other articles in this issue. It is nevertheless important to remember that close military associations with our British, Canadian, Australian and New Zealand allies span 65 years of wartime and peacetime experience since America's entry into World War I in 1917.

During both world wars, however, interoperability and standardization were undertaken only as "targets of opportunity" or when expedient, because time did not permit an across-the-board approach to these desirable attributes of any combined force.

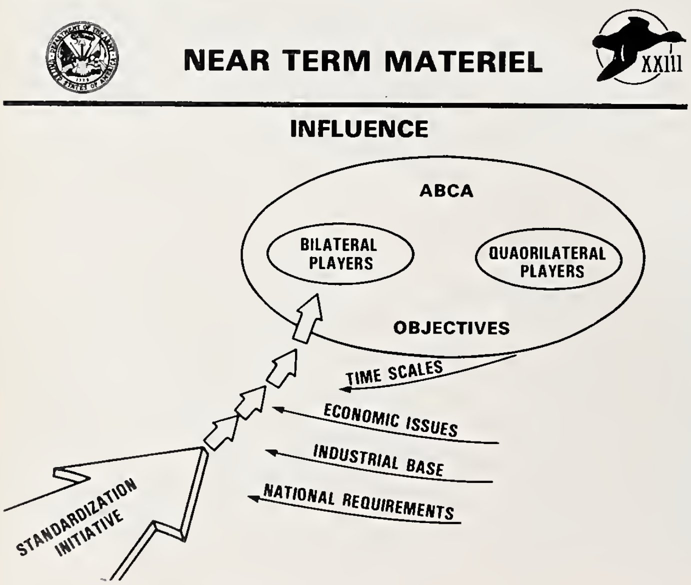
In the 34 years since inception of a formal cooperation program in 1947, levels of cooperative activity and standardization effort have increased dramatically. These endeavors evolved into a structured program and are, to this day, still guided by the primary objectives agreed to in the 1964 Basic Standardization Agreement (BSA).

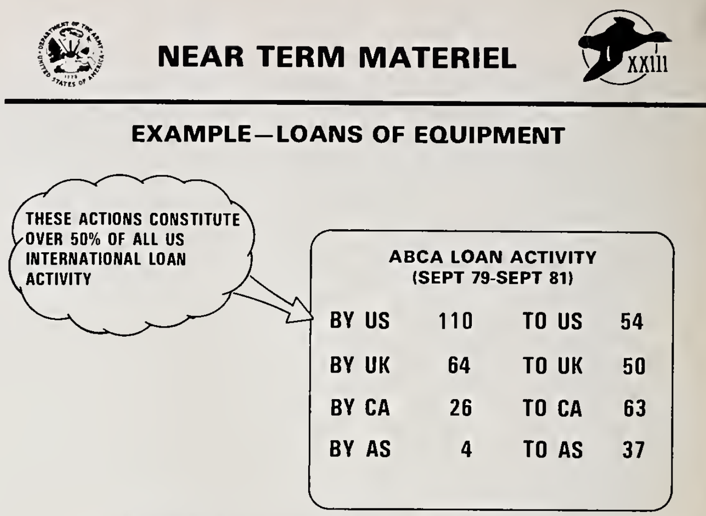
The 1964 BSA is especially significant because it is the "keystone" authority for emplacement and accreditation for nearly all of the activities and resources employed to develop materiel and non-materiel standardization and interoperability cooperation between member armies. The 1964 BSA recognizes and supports bilateral, as well as quadrilateral, cooperation and standardization efforts.

The nature and implications of the quadrilateral ABCA effort have been described in LTC Purks' article in this issue entitled "ABCA Standardization Program." One of the principal characteristics of quadrilateral work is that is is pursued primarily by part-time participants in the program who have other primary duties and responsibilities; e.g., members of QWGs, WSO, Deputy WSO and TEAL conferences. By direct contrast, the bilateral work is pursued by in-place activities, resources and people who are dedicated full-time to the international cooperation mission.

Under the BSA, each army has a "national office" in its national capital which administers and coordinates ABCA activities army-wide for each country. Each nation also has standardization representatives, stationed in each of the other three national capitals, to act as points of contact, action expediters, and conduits of information exchange for ABCA activities. For example, the U.S. Army has five people stationed as standardization representatives in London, two in Ottawa, and two in Canberra.

The United Kingdom, Canada and Australia collectively have about 50 standardization/liaison representatives stationed in the Washington, DC area and elsewhere in CONUS, and it is through these in-place activities that near-term materiel standardization is chiefly pursued.





Bilateral Cooperation Influences

Differences in requirements, priorities, development timescales, industrial capabilities and funding between the signatory nations tend to militate against attainment of near-term materiel standardization on a quadrilateral basis. Consequently, near-term standardization of equipment already fielded or in full scale development is more functionably pursued bilaterally.

These influencing factors tend to drive near-term materiel efforts into the bilateral arena, where two nations can more easily reach mutual accomodation to satisfy their particular needs (see Figure 1).

Bilaterial materiel standardization efforts, however, can in time lead to quadrilateral standardization, as national factors allow subsequent adoption by the other partners. In any case, bilateral efforts do conform to established ABCA priorities and promote cohesion, through standardization, among ABCA Armies.

Bilaterial Materiel Standardization

The various national offices, standardization representatives and liaison officers of the four nations are constantly attuned to new technology and materiel developments in the other partner countries. One of their most important functions is to identify allied materiel of interest to their respective armies and to nominate such items for evaluation, cooperative development, and perhaps eventual adoption, purchase or coproduction.

The significance of this function is highlighted here in Washington, DC by the permanent stationing of British, Canadian and most recently, Australian liaison officers, at HQ DARCOM.

Real-time information on technical, developmental, testing, and production matters is exchanged between the armies through their national offices, standardization representatives and on-site liaison officers.

The BCA Armies also have liaison officers permanently stationed at HQ TRADOC and at its Service schools and centers of doctrine and concepts development. The timeliness of information exchanged by these in-place, full-time participants is critical to near-time materiel standardization success.

New developments or existing equipment of one Army, which is of interest to one of its ABCA partners, may be provided quickly under the established ABCA standardization loan system. The respective national offices maintain accountability and process requests for equipment loaned and received under this system. Thus, equipment of interest to the U.S. Army, through the U.S. national office, may be placed into the U.S. International Materiel Evaluation (IME) Program administered by DARCOM's Test and Evaluation Command (TECOM).

Placement of foreign equipment into the IME Program normally requires that a valid U.S. Army requirements document exist for which foreign candidates may satisfy a legitimate need. U.S. adoption of foreign items may in certain instances be of considerable advantage to the U.S. Government, in terms of RDT&E dollar savings, technological advancement and reduction of acquisition leadtime. Such has certainly been the case with recent U.S. Army adoption of the Canadian Helicopter-mounted Wire Strike Protection System, U.K. Medium Girder Bridge, the U.K. Combat Support Boat and recent recommendation for type classification of the U.K. Link Reinforcing set for the Medium Girder Bridge.

In addition, the Canadian 30 pound Smoke Pot is currently in the U.S. IME Program. The U.S. and Canada are now operating under a memorandum of understanding for cooperative development of a new CB protective mask, and Australia has loaned 9mm parabellum ammunition to the U.S. Army for test.

The ABCA Standardization Loan Program is fast-moving and highly beneficial to all the participants. Figure 2 is a synopsis of ABCA loan activity over a 2-year period, showing items loaned by (and to) each nation. It is also interesting to note that well over 50 percent of all U.S. Army loan activity is with our BCA partners.

Other bilateral activities with our BCA partners include U.S.-U.K. Bilateral Combat Developments Talks (TRADOC is DA executive agent), the U.S.-Canadian defense development sharing program, and several defense development exchange agreements between the U.S. and Australia. Combined training exercises, unit exchanges and exchanges of personnel are also conducted bilaterally and multilaterally between the ABCA Armies on either a cyclic, rotational or regular (annual, biannual) basis.

U.S. Army ABCA Program

A number of U.S. Army principals and agencies such as Deputy Under Secretary of the Army, Vice Chief of Staff, DA Staff Agencies, U.S. Army Concepts Analysis Agency, U.S. Army Logistics Evaluation Agency, TRADOC and DARCOM have assigned roles in the ABCA Program. However, the major commands having the larger roles are the U.S. Army Materiel Development and Readiness Command (DARCOM) and the U.S. Army Training and Doctrine Command (TRADOC). These two major commands work closely as a team to fulfill the U.S. Army's commitments and to pursue both bilateral and quadrilateral activities with our BCA partners.

The DARCOM Role

The U.S. Army's executive agent for the ABCA Standardization Program is the International Research, Development and Standardization (IRD&S) Division in the Directorate for Development, Engineering and Acquisition, U.S. Army Materiel Development and Readiness Command (DARCOM).

Responsibility for staff supervision over U.S. Army standardization groups in the United Kingdom, Canada, and Australia is also involved in this assignment. (See *Army RD&A Magazine* July-August 1980.)

This executive agent responsibility entails providing overall management for the ABCA Standardization Program, including TEAL conferences. Under ABCA terminology, the IRD&S Division is known as the U.S. national office, and the office chief also serves as the U.S. Deputy WSO.

In support of this role, Army Regulation AR 34-1 promulgates procedures for U.S. coordination and management of the program as well as AR 34-a promulgating overall DA policy. The national office also coordinates all bilateral materiel-related activities with the BCA countries.

DARCOM Headquarters, its 10 major subordinate commands, 54 program/project managers, plus its laboratories, arsenals and depots provide military and civilian expertise, as requested, and participates in specified ABCA QWG meetings and TEAL conferences.

DARCOM has U.S. Army responsibility for six of the 20 QWG's and provides representation to many of the other 14 to support U.S. principal members in discussion of materiel standardization needs and preparation of selected concept papers.

In the role of the national office, the IRD&S Division coordinates development of Army policy and provides guidance to U.S. selection agencies and U.S. delegates participating in the 20 Quadripartite Working Groups, TEAL conferences, plus all bilateral materiel working parties, groups and meetings, as well as coordinating plans, actions, and positions with military departments, cognizant offices of DA/OSD, and, if needed, the JCS.

The office is also the coordination channel between the Army and U.S. Air Force, U.S. Navy and U.S. Marine Corps on all ABCA QSTAGS, and approves loans of U.S. Army materiel to the other armies to promote standardization.

TRADOC Role

The Deputy Chief of Staff for Combat Developments (DCSCD) at HQ TRADOC has primary staff responsibility for TRADOC participation in the ABCA Standardization Program with the Deputy Chief of Staff for Doctrine (DCSDOC) playing a major supporting role in the ABCA Program in the area of tactical and logistical concepts and doctrine.

As a U.S. Army proponent for doctrine, and in order to insure that the U.S. has a single voice in the international arenas, DCSDOC provides the U.S. representative to both ABCA, NATO and bilateral meetings which are concerned with the subject.

TRADOC staff offices, centers, schools and agencies provide qualified individuals (military or civilian) to represent the U.S., U.S. Army or TRADOC at specified ABCA QWG meetings and TEAL. TRADOC presently has responsibility for and provides the U.S. principal member to six of the QWGs which are concerned with tactical and logistics concepts and doctrine, and the development of requirements documents. It also provides representation to a large number of the other 15 QWGs for the purpose of supporting U.S. principal members as the user representative in discussions and preparation of ABCA concept papers.

TRADOC insures that common tactical and logistical doctrine contained in U.S. ratified QSTAGS is incorporated in appropriate training publications and taught at its Army Service schools. They rationalize tactical doctrine, procedures, organizations, product improvements, training and equipment training device requirements with ABCA Armies.

The major role in ABCA commenting procedures also belongs to TRADOC. In essence, they exchange comments with the BCA Armies on objectives and requirements documents for the purposes of: recognizing achievement of interoperability as an essential objective and to provide for possibilities and potential for interfaces (to be examined when initiating and commenting on development documents); identifying matching and potential objectives and requirements; providing, at an early stage, an exchange of information on technical and operational matters which can be considered during formulation of objectives/requirements; recommending degrees of standardization to be achieved; and allowing opportunity for a commenting Army to signify its degree of interest and where appropriate, to propose a form of cooperation.

During the past 30 years, our ability to work together with our BCA Allies in collective defense of our worldwide interests has been significantly enhanced. Our participation in ABCA has more recently led to efficient use of R&D resources. With new program thrusts and contemporary emphasis, even greater benefits in near-term materiel standardization should be realized from continued U.S. Army participation in ABCA.

COL HOWARD G. GLOCK is chief of the International Research, Development and Standardization Division, HQ DARCOM. He has served previously in the Office of the Deputy Chief of Staff for Research, Development and Acquisition, HQDA, and as the Army systems coordinator for the XM1 Tank. He is a 1956 graduate of the U.S. Military Academy and holds an MS degree from Georgia Tech.

11th Annual Project Managers Conference Held in Orlando

Using a totally different format of a largely unstructured agenda, the Army's project managers and principal Army RDA management officials met for a day and a half in Orlando, FL, to exchange views, air problems and seek solutions, and be updated on recent organizational and policy changes.

ASA (RD&A) Scully Presents PM of Year Award

Following the luncheon at the 11th Annual Project Managers Conference in Orlando, FL, on 16 November, Assistant Secretary of the Army (RD&A) Honorable Jay R. Sculley presented three awards. The first, that of the 1981 Secretary of the Army Award for Project Management, was presented to COL Monte J. Hatchett, PM, Multiple Launch Rocket System (MLRS).

The citation accompanying COL Hatchett's award read in part that his "superb management has allowed his program to enter the design maturation phase concurrent with low-rate production and initial production facilitization. Despite the complexities of such an endeavor, the program remains within established schedule, program cost and technical performance goals."

Noting that there were three nominees for the award, Secretary Sculley said that the choice had been extremely difficult. Therefore, an unusual step was being taken by the provision of a letter of congratulations from Secretary of the Army, John O. Marsh, Jr., to COL Charles C. Adsit, PM, Division Air Defense Gun (DIVAD), and to COL William P. Farmer, PM, Nuclear Munitions (NUCMUN).

Keith Cites Sec Army

GEN Donald R. Keith, commander of DARCOM, began the meeting by telling the group some of his observations of recent events that he thought would influence their activities. He noted, initially, that he believed the current Secretary of the Army and the Secretariat had joined the Army in a climate of cooperation that he had not seen for many years. Secretary Marsh had stressed however, said Keith, that the Army needed to look like soldiers, act like soldiers, and be a source of pride in the public's eyes. There was concern by Secretary Marsh that the Army needs to tell its story better. In order to do this, facts, not propagandic rhetoric, are required and much of the success of this endeavor is related to controlling costs Army-wide.

Keith said that Chief of Staff GEN E.C. Myer had told his senior commanders at a recent conference that one of the greatest tasks facing the Army today was to maintain the momentum of a number of positive actions already begun, and foremost of these was force modernization. GEN Myer intends to spend the bulk of his time, Keith continued, over the next year in enhancing force modernization. Also, said the DARCOM commander, cost control—of which this conference was to hear more, was a key element in the success of this modernization effort.

Keith pointed out that the new so-called Nunn Amendment requiring new unit costs of major defense systems would be of major concern to the PMs and that such information as was now available on the intent and methodology would be the matter of a subsequent presentation.

Keith expressed his belief that this had been an unusually turbulent year, a year in which it had been difficult "to read the tea leaves." Overall however, Keith felt the Army did well in its budget request despite disappointments in a multiyear contract request for Black Hawk and loss of some SOTAS funds.

An extremely important factor was the major management philosophy shift of the new administration's secretariat team—as spelled out in the so-called Carlucci initiatives, a shift more significant than any since former Secretary of Defense McNamara's day. The success of this philosophy of decentralization to the Services of much of the program management authority and accountability will depend, continued Keith, on how well the Services do the job. If we fail, the implications are obvious.

However, GEN Keith was optimistic. He praised the high level of talent available. What is needed now, he felt, was to get pointed in the proper direction and see that the resources are properly allocated. He felt that great progress had been made by GEN Myer's discussions with administration officials on the need for a national strategy as a road map with which to lay long-range plans. The planning, said Keith, is returning as the first P in the PPBS.

Keith noted the changes being made in both the military and civilian materiel acquisition management career fields as more and better qualified across-the-board people are needed. The complexity and the time are such today that OJT will not normally provide a satisfactory solution. (See RDA Nov/Dec 81, p. 11 for article on SC51).

GEN Keith concluded by stressing the urgency of fulfilling the DARCOM part of managing the force modernization program. In the past, he noted, there had been a lack of awareness by Army planners of what would fully be required down the line—things like new construction needs, new training require-

ments, and other supporting aspects. In order to correct this deficiency and provide for smooth integrating of the many new systems entering or due to enter the inventory, new force modernization offices have been established (See Army RDA Magazine July/Aug 81, p.19). This is a costly part of the effort and cannot be overlooked; it is not a one shot problem, he stressed, rather it is a future way of life.

The PMs, Keith continued, haven't used the tremendous talent available to them in problem solving in the Army depot and laboratory system. Here rests a tremendous depth of knowledge and experience in a variety of fields—a depth greater than that available to most contractors and consulting firms. Greater use of this talent, said the General, might have prevented many past mistakes.

Keith was followed by BG J.F. McCall, DARCOM comptroller, who gave a review on what his office knew of Section 917 of the 1982 authorization bill—the so called Nunn amendment. There are some semantics that need to be clarified, said McCall, such as what is really meant by the term "procurement unit cost." The bottom line of the amendment is that a quarterly report will be required of each PM of those programs on the March 1981 SAR list, providing total program acquisition unit cost; and, if the system has procurement funds, the procurement unit cost.

Additionally, the PM must file an immediate report if he has "reasonable cause to believe that either unit cost has exceeded or will exceed 15 percent above the March 81 SAR unit cost". GEN McCall noted that definition of "reasonable cause to believe" needs to be worked out. However, the evidence at hand, said McCall, is that the Nunn amendment appears to be headed for certain inclusion in the final appropriation act, and the Army's PM will have to respond.

There was some discussion following this as to whether some modifications could be sought to existing reports that would reduce the reporting load and yet provide the needed Congressional data.

Carlucci Initiatives

COL John C. McNerney, chief of Combat Army Group, Systems Review and Analysis Directorate, ODCSRDA, then gave a run-down on the Carlucci initiatives. These are not ideas that were thrown out once and now largely forgotten; rather, said McNerney, Mr. Carlucci requires monthly reports and at every opportunity asks senior service officials about progress in implementing his philosophy.

There are, in all, 32 so-called initiatives, and McNerney summarized the major areas. The milestone schedule is the same, the Colonel noted, only the level of decision had changed. Milestones I and III will be service level decisions now. System review criteria were altered for DSARC consideration to $200 million RDTE or $1 billion in procurement; for ASARC review the new levels are $150 and $600 million.

Preplanned product improvement—an evolutionary process that will minimize technical risk while providing quicker planned upgrading of systems, is another area where changes are necessary. All Army development programs are candidate systems for this approach, of which 4 or 5 could be funded, said McNerney. But the total dollar amount involved is considerable, he noted.

Multi-year procurement is an area where Carlucci sees major improvements. However, to make this a success the current ceiling of $5 million in cancellation costs and the inclusion in this of non-recurring costs only must be altered. It has been proposed that a ceiling of $100 million and the inclusion of both recurring and non-recurring costs be required.

Other items McNerney covered included greater program stability, economic production rates, funding for risk, decrease in information required at DSARCs, and changes in terminology. (COL McNerney will author an article for this magazine in the near future based on his presentation).

Industry Compared to Army

The audience received an interesting comparison from retired COL Len Marrella on industry's criteria for running a successful commercial program. Marrella is now a senior official with International Paper Co.

Marrella began by saying that the Army had no need to apologize for the way it manages its programs in comparison to industry.

In industry's case there are six essential criteria for successful management. These are a well-defined business objective and realistic expectations, an experienced project team with necessary authority, a definitized and disciplined workscope, good planning and control tools, meaningful contractual relationships which are tailored to the needs of each project, and a continuing focus on the business objectives and key profit variables. Concerning the first, Marrella said that realistic expectations is the real driving force. In the case of the second point—the experienced team, his company's analysis said that the common denominator to success was an experienced team.

Industry has a requirement process, he noted, and it was a very quantifiable thing: was there a market for the proposed product and could the product be made and sold at a profit for the company? The approval process however, of industry was simple—a 1-level board decision.

Industry tends to use matrix management whereby the industry PM has control of the whole process, even though many people do not work for him directly.

Army PMs, in his view, are today of high quality and are better trained for their job, something that was not the case 10 years ago.

The paper industry however, tends to take ''little bites'' in advancing technology—they can't afford failure due to too much risk.

A major difference exists, said Marrella, in the funding approach. Once an industry program is approved it is fully funded for the life of this program.

The government's contracting process has a big edge over industry's, said Marrella, with control far better. The bottom line difference however, seemed to be that industry always has a measureable requirement.

Cost and Control System

To provide the PMs with first-hand information on the Army's new Program Cost and Control System, the group was invited to ask questions of a panel of experts on the subject. The panel was composed of Mr. Roy D. Greene, acting deputy director—Program Management, DEA, HQ DARCOM; Mr. Edwin Greiner, assistant deputy for Materiel Readiness, HQ DARCOM; and Mr. James A. Hess, Jr., Systems Management Office, DEA, HQ DARCOM.

Before opening the panel for questions, Mr. Hess gave the audience a short summary of the system. The system, said Hess, is an Army-wide one that seeks to control not only R&D costs, but procurement costs, and operations and support costs.

The system is based, Hess continued, on four documents: a program directive that is a formal tasking document that serves as the primary source for baselines, goals, and thresholds, an annual program execution plan; a baseline cost; and a program status report.

The overall framework and limits of the program will be defined in the Program Directive Document, which will be approved at Department of the Army level and will provide the basis for the plan of execution. The PM will develop the cost baseline and its approval will be by HQ DARCOM.

The annual execution plan will set interim technical performance, resources, schedule, etc. The program goals and thresholds include any aspect of the program—ILS reporting system is designed as a 3-page document that displays key program indicators for top management.

Criteria for selection for inclusion in the system, said Hess, are a total cost of $500 million, OSD or Congressional high interest, program or technical turbulence, and the point along the life-cycle phase at which the program may be at the time.

The pay-offs, according to Hess, are that program decisions will be clearly documented, that planning will be realistic, that there will be program stability through a single source for program change, and finally, there will be a clear audit trail.

Considerable discussion then followed, with duplication of reports and strained manpower resources being a major topic.

Data Interchange

Mr. Edwin Greiner then described what is meant by data interchange and its importance to the PMs in their programs. Basically, it means the notification and follow-up by a PM to all the various commands that may have a piece of his program or have a requirement to support the PM.''It is a formal process'', said Greiner, ''not a telephone call.''

It requires adequate attention to funding and frequent follow-up. If the requirement changes, those involved must be told, since there can be a significant ripple effect. DARCOM Regulation 100-5 is the guiding authority.

Under Secretary Ambrose

As is always the case, the PMs were honored by a distinguished dinner speaker, and this year their guest was Hon James R. Ambrose, Under Secretary of the Army. Mr. Ambrose noted that the Army project manager system began in 1962 as a response to certain management shortfalls. Seven years later the PM process was reviewed; it was viewed as having the same weaknesses.

Now, said Ambrose, years after that review, things are essentially the same—increasingly high costs, increasing acquisition times, and alleged organizational constraints.

The Under Secretary noted that in the charter of each PM was the authority to invoke the full authority of the DARCOM commander for central management of his project. He also has direct access to the Chief of Staff and the Secretary of the Army. None had invoked such authority and Ambrose wondered

why. Such rights are a key management tool, he continued.

Mr. Ambrose told the audience that in conducting his business he uses three basic principles, principles which he commended to the audience. The first was integrity, and here he said he meant more than simply telling the truth, but to manage with an open book, exposing whatever problems there were to whatever exposure was necessary.

The second principle was objectivity. Here he was talking of being realistic regardless of personal biases and pleas of others involved.

Third, realism, involves realistic assessment to changes of performance, need for funds, and success of procurement. Nothing would be hidden.

The speaker then proceeded to tick off a suggested checklist for a PM. The first concerned adequacy of government estimates. Too many programs, Ambrose contended, have been started with inadequate government estimates. He urged that the inherent talent in the Army be better utilized, rather than relying on non-responsible contractors or consultants.

Realism in design to unit cost is the second item on the PM list. This is an area where experience has shown the end cost to be quite different than the start cost. It is an area where the government must improve its capability.

Weakness in producibility engineering and manufacturing is a third point, and said Ambrose, it is most important because this is where the big bucks rest. Much improved talent is needed here.

Rationalizing performance shortfalls has been another weakness where PMs should pay greater attention, said Ambrose.

Timely decisions have to be made, he continued, on such things as delays, scheduling, etc. There are many, many "helpers" ready to leap in to the PM's dismay, should he fail to act and act promptly.

Similarly, said the Under Secretary, he had a checklist for HQDA and HQ DARCOM. It was the responsibility of these higher headquarters to prevent "buying in"—at either a too high or a too low cost. It is also their responsibility to see that there is effective competition and funding stability to a program. So-called joint programs tend to be traps, with each Service deciding yearly what priority it will play. This facading should be ended in favor of a more definitive arrangement.

Additionally, the massive regulation millstone, said Ambrose, had to be lightened, particularly on the documentation required of potential contractors.

There are also those areas where there is a common responsibility, said Ambrose. There is too much rationalization and deferring of certain unpopular or uninteresting aspects of a program, yet these aspects too often are essential, even critical elements. All aspects of a program must be considered when it is due for consideration.

Super salesmanship versus factual assessment is another area where all must exert caution.

Finally there is what has become known today as the "economics" factor. This is the justification for rising costs due to apparent exterior economic causes. This is probably, said Ambrose, the single largest killing factor to dollar shortage in Army accounts today. In private industry, he noted, a company would be bankrupt if it acceded to such a principle. He noted one defense program where the contractor uses a commercial diesel engine, wherein the cost of the diesel engine had actually decreased where everything else had risen.

We are living on the edge of a cliff said Ambrose. Congressmen have cut social programs drastically to the point where many fear their non-reelection. Against this is the perception that military costs are out of control. The final result, concluded Ambrose, was that there could be an inversal of the Reagan goal of upgrading the U.S. defense capability.

Final Sessions

The PMs were given, on the final day, an in-depth session on contracting. It included presentations on multi-year, and on industrial engineering/should-cost by Mr. William L. Clemons, deputy director for Procurement and Production, HQ DARCOM, and Mr. John R. Jury, chief assistant, Policies Branch. DRCPP, HQ DARCOM.

The wrap-up briefing was a survey of the scope and capability of DARCOM's depot system by BG Jack A. Apperson, commander DESCOM. Apperson pointed out the stability of his workforce and the tremendous wealth of talent in a variety of fields that is and can be even more widely used by the PMs.

The concensus of those queried as to their preference of formats for such PM conferences, i.e., a full agenda of formal presentations—the structured approach, versus the unstructured format used at this conference, indicated a high preference for the unstructured format. The primary reasons given were that topics of most concern received full discussion and there was far greater opportunity for the one-on-one interplay between the PM and the DARCOM commander.

A Look Into the Future

By Norman R. Augustine

The following "Look into the Future" article by Mr. Norman R. Augustine is based on several well received talks that he gave to the Army Science Board and to senior technical groups of the Army, Navy and Air Force. Mr. Augustine is well known in the U.S. defense acquisition community and enjoys an extremely high reputation. He previously served as Assistant Secretary of the Army (R&D), and then Under Secretary of the Army. He is now Vice President, Operations, Martin Marietta Aerospace.

The year 2000 now lies about the same "distance" ahead as the year 1960 lies behind. If one could somehow predict the events of the year 2000 with the same clarity as we now see the year 1960, one would then truly have, for the first time, the equivalent of 20:20 hindsight!

The old Chinese proverb regarding the difficulty of prophesying, especially about the future, seems to be devastatingly accurate. It is nonetheless useful to visualize military equipment as it might appear in the year 2000. . . albeit with decidedly imperfect 20:20 hindsight.

A peek at future nonnuclear military combat may have already been offered in the 1967 and 1973 Mideast wars. During the latter, combat was so intense that the various forces lost use of about a third of their aircraft, artillery, and tanks in a period of just 18 days.

Ironically, throughout history it has been a truism that most ordnance fails to hit its expected target. It is said the goal during the V-2 development activities at Penemunde was to reach a stage of maturity where it would be more dangerous to be at the predicted impact point than at the launch point!

Even with a weapon having the precision of a "rifle," chances of actually hitting a target are miniscule. In the Civil War, 9,000 rounds were fired per casualty produced; in World War I the number was 5,000; and in World War II and Southeast Asia the numbers were 12,000 and 70,000, respectively.

The decade of the 1970's saw this expectation of missing the target change dramatically. Strategic weapons achieved for the first time sufficient accuracy for a single reliable missile to destroy virtually any target whose position was known.

Tactical systems which previously dominated battle on land, sea, and in the air suddenly found themselves threatened. The lightweight man-portable antitank missile made the individual infantryman a considerable threat to the powerful tank.

Shoulder-fired missiles substantially redressed the imbalance between the individual soldier and close-air-support aircraft. Additionally, the advent of antiship missiles, as used against the Israeli ship, *Eilat*, illustrated convincingly the vulnerability of surface ships under certain conditions.

The newly discovered weapon-delivery precision was not limited strictly to missiles but was also incorporated into conventional bombs through the addition of laser semiactive-guidance kits, such as those used in Southeast Asia.

The Copperhead guided artillery round, for example, has demonstrated the ability to destroy a *moving* tank with a single reliable round at ranges well outside the view of a forward observer. This is achieved by using a remotely piloted vehicle. This feat would require some 2,500 rounds of conventional artillery under the best of conditions.

It is ironic that the problem of hitting targets was largely solved before the problem of finding them. Technology of the 1980's thus appears likely to be geared to the "finding" problem.

Airborne radar warning and control systems, have made surveillance of enormous volumes (a million cubic miles) of airspace down to treetop level from a single platform a reality.

Similarly, existing surveillance systems can monitor most spacecraft in near-Earth orbit. The advent of a precision emitter location system will put the survival of most rf-radiating sources on the Earth's surface very much in jeopardy.

Development of a variety of ground-target surveillance radar systems, carried by extremely long endurance platforms, suggests that there may no longer be many places to hide on the ground. . . particularly for objects which move.

Advanced night-vision systems have already denied concealment by darkness, and attention is turning to peeling away the cover of weather as surely as one peels away the layers of an onion.

It thus seems likely that soon the only remaining places to hide will be in "deep" space, under the water, or under the ground. The Trident missile system exploits one of these hideouts, operating for months at a time under the surface of the ocean, while the MX missile in its original configuration was concealed underground.

A major aim of the 1980's for both Free World and Communist nations will be to eliminate these last sanctuaries, and in particular, to make the ocean transparent.

If the 1970's witnessed the advent of military systems that will hit their intended targets, and the 1980's can be expected to construct the groundwork for finding those targets, what then remains? To *survive!*

The agenda for the 1990's (and to some extent the 1980's) will focuse heavily on survivability: making aircraft more survivable, spacecraft more durable, ships more resilient, and the infantryman himself more survivable. . . all in the systems context of avoiding detection, avoiding being hit if detected, and avoiding damage if hit. The possibilities include seeking *substitutes* for aircraft, spacecraft, ships, and yes, perhaps even the venerable infantryman.

How is all this to be done? At least three approaches seem likely. The first was suggested centuries ago by Ardant DuPique, who noted that, "To fight from a distance is instinctive in man." Vastly increased usage of standoff weapons, launched from platforms well outside the range of at least the enemy's "terminal defenses," seems highly probable.

Secondly, warfare will likely see a revolution in the use of robots. Just as robots are already being used in factories throughout the industrialized world—including factories where robots now make other robots—a wide spectrum of military missions for devices of this general category are conceivable. These missions range from "leave-behind" antitank missile systems that automatically acquire and engage armored threats to remotely piloted mini-aircraft (such as the Aquilla, now in development).

Remotely implanted homing mines, also a form of robot, should be expected. Such systems would be implaced by standoff rockets similar to the remote sensors launched by artillery along the Ho Chi Minh trail in Vietnam.

The third approach may be considered under the general subject of "countermeasures"—interfering with the enemy's systems through either active or passive means. Such means might include precision emitter location sensors coupled with command-guided attack missiles or ordinary anti-radiation missiles to suppress air defenses. There will also be a need for increased emphasis on optical countermeasures.

Efforts of the past decade to permit platforms, particularly aircraft, to sustain hits and survive will likely have less payoff in the years ahead as ordnance becomes increasingly lethal. Focus will have to shift to shooting first and avoiding hits.

It also seems probable that the intense focus in the past on weapon *platforms* (possibly even an over-emphasis), will shift toward improving the sensors and weaponry to be added to the platforms. In these latter areas, technology seems to offer the greatest promise of truly enormous strides. This is not to say there will be no major advancements in airframe, ship or ground vehicle technology.

The impact of new technologies may indeed introduce a new "arithmetic" for assessing the feasibility of some types of operations. It may become practicable to construct very large aircraft, weighing on the order of a half-million pounds, and to operate them from sanctuary bases within the U.S. from whence they will conduct conventional (nonnuclear) operations in such distant places as the Arabian Gulf. Such a concept might be dubbed an ICCBM. . . InterContinental Conventional Bombing Mission.

Given suitable tanker refueling support and the requisite sensors to acquire battlefield targets, a single aircraft could carry on the order of thirty 100-mile range standoff weapons, each employing command guidance of relatively low costs.

Once delivered into the "basket" above the enemy target complex, each weapon would in turn eject on the order of 10 submissiles, somewhat analogous to the MIRV's (multiple independently-targetable reentry vehicles) now commonplace in strategic forces.

Each submissile would contain its own terminal guidance to engage a tank or other appropriate target. If even one in five of the submissiles eventually hit, say, a tank, a single sortie of such an aircraft would provide a "quarter of a division" in destruction capability when measured in terms of Pact armored forces' tank complements.

With such a level of destructiveness one could contemplate, if necessary, very high "acceptable" aircraft attrition rates. Escort air-defense systems would be a possible alternative, perhaps ultimately involving the use of high-energy-laser air-defense aircraft to lessen attrition.

In the case of the strategic offensive force, the first task will be to replace the existing fixed land-based ICBMs. Virtually all observers now agree that in their present configuration those systems are being made obsolescent by MIRV'd high-precision missiles with nuclear warheads.

Similarly, the aging B-52 force which now includes pilots who are younger than the aircraft they fly, must also eventually be replaced to preserve the strategic triad. The B-52 nonetheless still offers capability for some years ahead, particularly when coupled with present and future generations of standoff missiles. . . both nuclear and conventional.

Finally, modernization of the strategic submarine force already proceeds apace.

Turning to the defensive side of the strategic balance, ballistic-missile defense missions will likely undergo a resurgence with the development of extremely sensitive, high-resolution infrared detectors. These are suitable for use in space with a nonnuclear exoatmospheric interceptor system.

Perhaps even more important is the preferential use of deep terminal defenses in a shell game concept which offers ballistic-missile defense—for the first time—inherently high leverage as compared with the offense.

The most highly leveraged form of ballistic-missile defense, boost-phase intercept, appears to be *much* less near at hand. Eventually, a space-based high-energy-laser system may provide the first practicable opportunity to accomplish this high-payoff mission. . .but only at enormous cost and not without counters.

In addition, the acquisition of nuclear weapons by many nations may necessitate a "light" area-defense system to provide a "thin" but highly reliable protective umbrella. Similar logic seems to argue forcefully for civil defense—but with no more likely success for action in the future than in the past.

Turning to space, high priority for deployment of an antisatellite capability seems appropriate. It appears inevitable that space will become a battleground during *"conventional"* wars of the future.

On the surface of the ocean, the principal future uncertainty concerns the survivability of major combatants, especially aircraft carriers. Some 80 to 95 percent of all military supplies will almost assuredly be shipped by sea because of the tonnages involved.

Ocean lines of communication for distribution of oil are equally essential in both peacetime and wartime. This makes the ocean-control mission (as contrasted with much simplier ocean denial mission) of the utmost importance. As the saying goes, if one can't get to the war it may come to you.

It may be that the future will see in fleet air defense a greater focus on very long-range shipboard surface-to-air-missiles, with aircraft used more as carriers of sensors for target acquisition and weapon guidance than as weapon-launching platforms. Such aircraft could be given V/STOL capability and be "rearmed in the air" by long-range ship-launched missiles they would help guide to targets. The threat to the surface battle group will nonetheless continue to increase. This may well include ballistic nonnuclear homing missiles of even intercontinental range. Such developments could potentially lead to a further role for submarines: land attack against high-priority targets using relatively long-range nonnuclear standoff missiles.

Because of their numerical inferiority, our land forces can be expected to face "target-rich environments" (an expression sometimes attributed to Custer). Moreover, our ground forces may have to operate, at least for a time, without air superiority. This situation has not been faced on a broad scale in the lifetime of most American troops.

Also, the survivability of the tank is more in doubt today despite great strides in increasing its ability to shoot while moving, fight at night, employ advanced armor, and exploit exceptional agility. On the other hand, it is to be hoped that the tank *does* become obsolete. Soviet tanks, of course, outnumber our's four to one. However, for the time being, reports of the demise of the tank should be considered very premature.

Ground-based air defenses have grown to such numbers that aircraft will be operating within the potential envelope of at least one air-defense system at virtually all times. This elevates the

importance of countermeasures and defense suppression on the part of the offense and passive detection systems on the part of the defense. To radiate and remain stationary will become a prime formula for destruction by the year 2000.

The helicopter, which came of age in the late 1960's, can be expected to take on further importance. In *some* respects it may be viewed as a "tank" that operates in three dimensions and trades agility for armor. Today's attack helicopters carry cannon of larger caliber than some tanks used early in World War II, and some carry a variety of highly accurate standoff missiles.

Air-to-air combat between helicopters, such as the U.S. AAH and the Soviet HIND, appear inevitable in any conflict involving both. Moreover, the helicopter will likely evolve gradually into a "blended" system that combines many of its traditional attributes with the avantages of fixed-wing aircraft.

Viewing the tactical air battle "from the ground up," the survivability of fixed air bases will come increasingly into question. This is certainly true in nuclear warfare and to a lesser but still significant degree in conventional warfare. This places greater importance on V/STOL operations.

The need to strike first, particularly when outnumbered, will necessitate ever greater reliance on electronic IFF (Identification Friend or Foe) and fighting at a distance.

It will become less and less practical to operate in the dense air-defense zones being established in the Soviet Union, Eastern Europe, and in many other parts of the world. The first task in future air operations will then be to suppress air defenses using standoff missiles, remotely piloted vehicles, and special-purpose aircraft. Increased emphasis appears likely on hard-kill systems as compared with ECM above.

Relative to logistics support, larger aircraft for strategic lift may be necessary. A heavylift helicopter might also be required for off-loading transport ships where ports have been destroyed and for movement of supplies to temporary bases which cannot afford the luxury of a runway.

A closing comment seems in order regarding standoff weaponry. This is an area which might take on decisive importance. The notion of "smart" ordance—referring to missiles and bombs with precision terminal guidance—has become widespread.

Actually, the so-called smart weapons appear to have an IQ of only about "25" in human terms because of their limitations in target acquisition. Even this, nonetheless, represents a significant advancement over "dumb" bombs, which are still planned for extensive use.

The now-emerging algorithms for pattern recognition together with precision guidance and low-cost data processing, suggest that it may be possible to develop affordable missiles and fire-control systems that can be totally self-sufficient. Such missiles (dubbed "Brilliant Missiles" by the author in 1977) would only need launching in the general direction of a suspected enemy force. They would then autonomously determine the targets available, automatically rank those targets, and subsequently attack the threat of highest priority.

Finally, any discussion of the combat systems of the year 2000 would not be complete without noting the enormous role played by command, control, communication, and intelligence (C^3I) systems and the need to improve these. The battle could well be won or lost, particularly for a numerically inferior conventional force, in this arena.

From the technological standpoint in the decade of the 70s, the offense seems to have won the strategic-warfare battle and the surface naval battle while the defense won the air and land battles. Whether this will be reversed remains to be seen.

It also remains to be seen if future technological breakthroughs will equal in their impact such past ones as the stirrup, the longbow, the rifle, the machine gun, the tank, the submarine, the airplane, the atomic bomb, and the ICBM. Only time will tell whether technology will produce a deterrent to tactical warfare as effective as the deterrent to strategic warfare.

Personnel Cooling System Tested at Fort Sill

A microclimate personnel liquid cooling system, developed jointly by the Army's Mobility Equipment Research and Development Command and Natick Laboratories, is being field tested at Fort Sill, OK as part of the Human Engineering Laboratory Battalion Artillery Test (HELBAT) program.

The system is designed to relieve heat stress for combat vehicle crewmen. It has been installed in an artillery fire direction control vehicle for HELBAT 8, a field test program for evaluating new concepts.

The liquid cooling system is basically a water chiller. It transports cool liquid into a vest worn by the vehicle crewman under his clothing. The vest provides relief from heat stress for the crewman even when heavy protective overgarments are worn, such as those required for chemical and biological warfare conditions.

Each soldier's vest is connected to supply and return manifolds inside the vehicle with two relatively short, flexible, insulated liquid lines. Quick connections are available at several stations within the crew compartment so that the soldier can connect and disconnect if he has to move around or exit the vehicle.

Using an ethylene glycol and water mixture as the coolant, the system is designed to protect soldiers from heat exhaustion even when temperatures inside the vehicle reach as high as 140 degrees Fahrenheit. The system is also capable of circulating warm liquid to protect soldiers from cold temperatures.

The prototype fire direction control vehicle used in HELBAT 8 is also equipped with an air conditioner system to cool the crew compartment. A 36,000 BTUH conventional, horizontal, military air conditioning unit operates in conjunction with a collective protection unit furnished by Army Chemical Systems Laboratory. This system provides clean filtered air to the crew compartment and maintains a positive pressure inside. The air conditioning system requires that the vehicle be sealed in a contaminated environment.

The microclimate cooling system can also be used with a sealed crew compartment, but offers the advantage of functioning equally well if the crew wears protective clothing and ventilated face masks. However, the main advantages of the liquid system are its small size and low power requirements.

During HELBAT 8, both the liquid and air conditioner cooling systems are being evaluated to determine which will finally be adopted for use in the fire direction control vehicle.

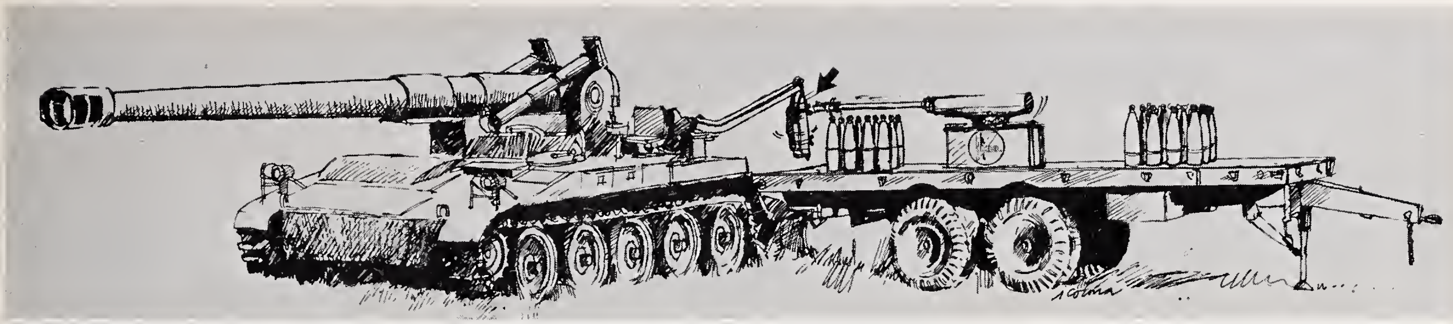


Illustration to reality? Robot (center of flatbed trailer) is designed to use its "arm" to pick up a projectile and transfer it to an existing hoist on the M110A2 self-propelled howitzer (see arrow). The gun-crew will then set the fuze, ram the round into the tube, load the propellent charge, close the breach, and fire the weapon.

HEL Establishes Robotic Technology Demonstration Project

The U.S. Army Human Engineering Laboratory, lead agency in DARCOM for robotics, is undertaking a "feasibility study" to determine whether a robot can perform loading tasks on the M110A2 eight-inch self-propelled howitzer.

"We're going to look at the possibility of using a robotic device to improve the capability of existing Army weapons and equipment," said Mr. Charles Shoemaker, the robotics project coordinator for HEL.

Called the "Robotic Technology Demonstration Project," it is designed to demonstrate the feasibility of using robots to augment existing combat hardware, such as the howitzer.

"Normally, four men ride on the howitzer itself," Shoemaker said. "Six men ride on a truck or tracked vehicle which carries the ammunition for resupply. The M110A2 itself carries very few rounds." With the aid of a robot the six men who ride on the ammo resupply vehicle will be able to carry out other, less workload-demanding, tasks.

"We'll be demonstrating that a robot can load a round onto an ammunition resupply vehicle and keep a running inventory of type, location, and lot number of each round," he said.

"When a crew member on the howitzer calls for a round by pushing a button indicating which type of round he wants, the robot will then search for the round, pull it out of the rack, transfer it to a fusing machine where the noseplug will be removed and a fuse inserted.

"The round will then be transferred to an existing hoist on the weapon. The crew will take over from there; they'll set the fuse, ram the round into the tube, load the propellent charge, close the breach, and fire the weapon."

Working on a howitzer is not considered an easy job. However, when soldiers must wear chemical protective gear, their rapid increase in body temperature, while doing the job, makes the work almost impossible to carry on for any length of time. Using a robot to relieve the pressure on the six-man crew on the ammo vehicle will reportedly solve this problem. It will also help stave off manpower shortages in the Army.

The feasibility study will use a Unimation 4000 series industrial robot, a microcomputer, which will "tell" the robot how to respond to the crew's commands, a low-boy trailer, and other existing equipment. HEL is working with the Ammunition Equipment Office at Tooele Army Depot, UT, which has pioneered the use of robotic equipment in ammunition dimilitarization.

BRL Physicists Use French Shock Tube Facility

A group of physicists assigned to the U.S. Army Armament R&D Command's Ballistic Research Laboratory (BRL) was invited to Southern France this past summer to utilize a test facility in connection with ongoing investigations of blast response on an American Army truck shelter system.

The four-man science team, Mr. Noel Ethridge, Mr. Robert Raley, Mr. William Schuman and Mr. George Teel, all assigned to the Target Loading and Response Branch in BRL's Terminal Ballistic Division, made the trip to the French city of Gramat to take advantage of a large shock tube facility measuring 105-meters-long by 12-meters-wide and seven-meters-high. It is much larger than any comparable facility in the U.S.

Raley, a spokesman for the BRL research group, said a series of three tests they conducted on a 2½-ton cargo truck, equipped with a reinforced electronic shelter attached to the truck's bed, were highly successful and will help to improve the Army's ability to predict vehicle overturning from a shock blast produced by a nuclear weapon.

Raley also noted that although the French shock tube utilizes the sudden release of compressed air to generate a shock wave like that produced by a nuclear weapon, no radiation is produced by the simulator. Consequently, there is no subsequent harm to the environment even though the shock wave delivers a tremendous amount of energy approaching a wind velocity associated with an enormous hurricane.

Raley said that the BRL scientists experience in the French test facility would prove advantageous if a similar shock tube facility was ever designed and constructed in the U.S.

Government Saves $1.4 Million Through CSL Employee's Efforts

Government savings of more than $1.4 million during a 6-year period could reportedly be achieved as a result of an Army Chemical Systems Laboratory employee's efforts to produce a safer smoke grenade.

Mr. Mike Smith, a chemist in the CSL's Munitions Division, has been credited with conducting a search for a safer organic dye for use with the Army's M18 smoke grenade.

The M18 is the Army's standard field item used for signaling and marking purposes. It creates a cloud of yellow, green, red or violet smoke which burns for about 90 seconds. Depending on wind conditions, the smoke can linger over an area for about three minutes.

Specifically, Smith produced a dye that would lessen the possibility of irritating a soldier's skin. Thus far, savings have been achieved in the production of yellow and green dyes. Product improvement on red and violet dyes is scheduled to begin in 1984.

Improving Helicopter Survivability Through Smoke/Aerosol Technology

By Earl C. Gilbert

Army attack helicopters such as the AH-1S will play a key role in defeating enemy armored forces in any future armed conflict. However, they face a difficult task in accomplishing this objective and surviving the many threat systems being fielded.

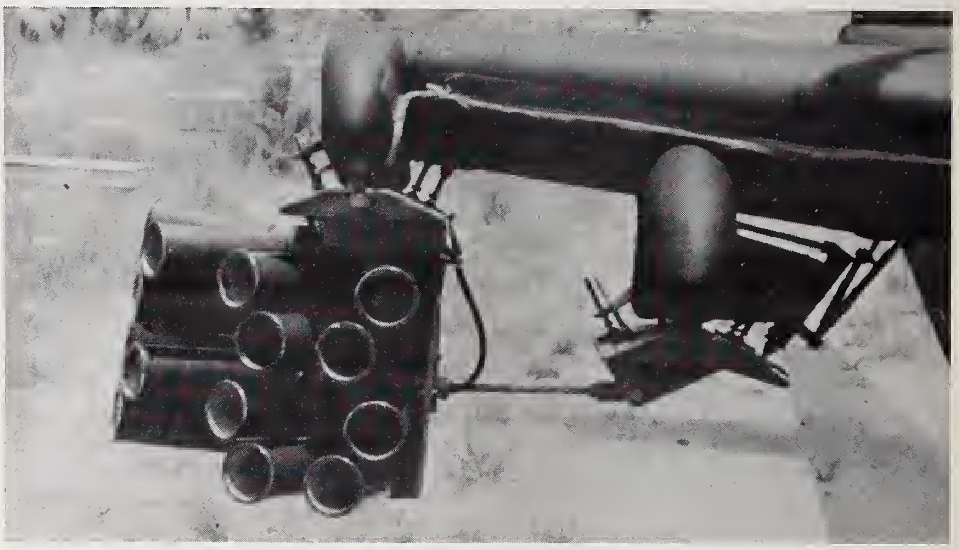
To answer this, Army research has successfully developed countermeasure systems that provide a high degree of survivability against many of these threats. Yet there is still a critical need to reduce the threat presented by enemy optically sighted and laser-range-finder-augmented ballistic antiaircraft weapons, and by laser-beam-riding missile systems.

Research conducted at the U.S. Army Aviation Research and Development Command's Applied Technology Laboratory (ATL), Fort Eustis, VA, has investigated and identified smoke/aerosol technology as potentially useful for this countermeasure application. Feasibility was established in a 3-phase program conducted in the mid-1970's.

Phase I quantified attack helicopter antiarmor operational scenarios, and desired smoke/aerosol deployment characteristics and performance requirements for a smoke screen against the afore-mentioned threats. Constraints for such a system, such as weight and aircrew work load that were compatible with operation of the helicopter and its mission, were also identified.

Phase II was structured to provide a technology base for conceptual system development by reviewing state-of-the-art smoke/aerosol formulations, agent disseminating systems, and ordnance delivery systems such as rocket launchers and cannon that might, with slight modification, have features adaptable to the smoke/aerosol countermeasure concept application.

In Phase III, using the system characteristics identified as necessary for the countermeasure application and the technology base identified in Phases I and II, a series of smoke/aerosol screening concepts were developed. An engineering trade-off analysis identified the best of these. This concept consisted of a suitable smoke/aerosol agent, turret-type grenade launcher, laser detector/locator device, turret pointing mechanism, and aircraft integration electronics.



AH-1-Mounted Smoke Screening System

The launcher turret, located on the fuselage below the cockpit just aft of the gun turret on the AH-1S, can rotate and fire smoke grenades from 105 degrees left to 105 degrees right in azimuth. The grenades burst about 125 feet from the aircraft. The estimated weight of this concept is very modest.

There are three possible modes of operation for the system. In the first mode, the pilot or gunner has a control mechanism which contains an element that can be pointed in the direction of the threat. The turret mechanism is linked to the pointer, and the launcher is fired manually. The second mode of operation requires the turret to be linked to the helmet sight for pointing and again the launcher is fired manually. In the third mode, the turret is integrated with the laser detector/locator device for automatic pointing when the aircraft is laser illuminated and the launcher is fired automatically.

As the tactical situation dictated, a large smoke screening cloud could be placed between the threat systems and the aircraft. This screen would be large enough to enable the helicopter to complete a particular engagement sequence against the target and/or successfully take evasive action in the event the pilot felt that action necessary.

An example of a scenario where the system could be used envisions nap-of-the-earth flight to a location where a hover-up maneuver is executed to engage a tank with a TOW Missile at 0 degrees azimuth. It is assumed that the aircraft is illuminated from the 90-degree location by a laser device coupled to a missile system.

Ordinarily the pilot would have only two options; he could immediately disengage from the target and take action to remask the aircraft or continue the engagement with the associated high degree of risk of attrition to himself.

With the smoke capability, the pilot could complete the engagement with the tank target by placing a protective/screening cloud between the aircraft and the AAA threat system to his flank before taking action to remask. This in only one of many engagement scenarios where it is believed that the proposed system could provide a useful countermeasure function.

Once theoretical feasibility of the concept was established, steps were taken to develop validating test data. This was accomplished by adapting the XM-243 launcher and L8A1 smoke grenades to an AH-1 helicopter. These two elements form a smoke screening system currently being retrofitted to all Army armored ground vehicles to provide protection from visually sighted threat systems.

The experimental system simulation hardware is shown in the accompanying photo. Bulk and weight were unim-

portant for this mockup hardware. The ability to provide functional aspects of the countermeasure concept were, at this point in the program, the important considerations in demonstrating feasibility.

The aircraft/launcher interface structure of the mockup hardware positioned two horizontally mounted XM-243 launcher tubes at a 0- or 7½-degree evaluating angle relative to the horizontal centerline of the aircraft. The unit was capable of firing two modified L8A1 grenades at each azimuth of 0, 15, 30, 45, 60, 75, 90 and 105 degrees.

A simple firing control unit was designed to be strapped to the pilot's or gunner's thigh. The unit had a pointer that could be positioned at 15-degree increments corresponding to launcher tube direction. A grenade was launched by pressing a firing switch.

If adjacent tubes pointing in other directions were to be fired, the firing switch would be depressed and the pointer swept through the corresponding positions on the firing unit. This mockup hardware provided a capability of firing from 1 to 16 modified L8A1 smoke grenades, one at a time or in salvo.

Following fabrication, ground and laboratory testing of the unit was conducted to insure that it was safe to be mounted on an aircraft for flight testing. Flight testing was then conducted to determine characteristics of the modified L8A1 grenades when fired singly and in multiples from a hovering helicopter.

Characteristics of interest were cloud size, shape and density, smoke persistence, effects of rotor downwash, screening effectiveness, and degree of flexibility available to the pilot/gunner in controlling the smoke cloud and aircraft to increase effectiveness of the system. In addition, the tests were to enhance the understanding of the system's potential in countering a threat and to evaluation operational/survivability considerations associated with hovering the helicopter in close proximity to the smoke cloud.

Testing of this unit went a long way toward validating the feasibility of the helicopter smoke/aerosol system for providing a countermeasure from the visual and laser designator/range-finder-coupled antiaircraft weapon threat.

Currently, ATL is engaged in two efforts related to this countermeasure concept. In the first, an experimental smoke grenade launcher is being developed. In addition, development of a smoke/aerosol grenade for this launcher and countermeasure application is also in process. Grenade launcher development take full advantage of results of the mockup testing and state-of-the-art smoke/aerosol technology.

Testing of this hardware under simulated tactical conditions will provide an opportunity for a more comprehensive evaluation of the smoke/aerosol system's potential for enhancing the mission/combat effectiveness of Army helicopters.

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Carlucci Cites Changes in Acquisition Process

Deputy Secretary of Defense Frank C. Carlucci testified recently before the Senate Government Affairs Committee concerning progress the DOD has made by improving the Defense acquisition process, reducing weapon systems costs, and improving military readiness. He expanded on earlier statements by Secretary of Defense Caspar W. Weinberger.

Mr. Carlucci outlined his perceptions of the reasons for cost growth in an unpredictable economic climate. Inflation and quantity and schedule changes resulting from threat and requirement changes were major factors, he said.

Significant changes in the acquisition process were announced in a memorandum signed by Carlucci on April 30, 1981 with the goal of implementing good business management throughout the DOD acquisition community. Carlucci summarized the eight major acquisition management principles and the 32 separate actions.

Carlucci highlighted the following ways in which DOD is implementing the Acquisition Improvement Program:

- Program Stability—requesting the services to identify stable programs.
- Multi-year Contracting—which could result in average dollar savings of 10 to 20 percent in unit procurement cost.
- Preplanned Product Improvement—to field more systems sooner at lower cost while continuing to develop higher performance alternatives.
- Front-End Planning—providing industry incentives to insure quality assurance, reliability, readiness, and supportability.
- Lowering Administrative Costs—reviewing the Financial Management Information System (FMIS) to simplify and reduce internal reporting requirements.
- Streamlining the DSARC Process—simplifying the process without weakening oversight accountability.
- Increasing Productivity—to include supporting the Administration's legislative initiatives in the Economic Recovery Act Tax of 1981 permitting more rapid capital equipment depreciation and guidance to program managers to enable companies to share in cost reductions.
- Competition—continuing the already established firm policy by DOD to purchase required supplies and services on a competitive basis whenever possible.

Carlucci emphasized implementation of the acquisition improvements is an important objective of the newly established DOD Council on Integrity and Management Improvement chaired by the Deputy Secretary of Defense and including the Under Secretaries of the Military Departments, Dr. Richard DeLauer, Under Secretary of Defense for Research and Engineering, Dr. Lawrence Korb, Assistant Secretary of Defense for MRA&L, and Mr. Joe Sherick, Assistant to the Secretary of Defense for Review and Oversight.

Radar Data Acquisition Technology May Improve Missile R&D

Application of a new radar data acquisition and reduction technology at White Sands Missile Range (WSMR) reportedly holds much promise for future improvements in missile research and development.

Known as "target motion resolution," this technology provides more information about a missile's test performance than was previously attainable. In addition, important economic benefits may be realized because the information is obtained through signals provided by radars already in operation at the range.

Target motion resolution is a technique for obtaining information contained in the phase and amplitude variations of radar signals reflected from moving targets and recorded by the radar equipment.

For example, when a missile being tested changes its position relative to a radar, phase and amplitude variations will arise from the motion of the vehicle itself, as well as from scattering centers on the body, such as fins.

Target motion resolution procedures basically allow the reflected radar signal to be taken apart and examined so the motion of the object relative to the radar, and any spin or wobble experienced during flight, can be determined.

According to Mr. Jerry Claessen, a senior data analyst who operates the radar graphics laboratory in the Data Sciences Division of National Range Operations Directorate, the technology is growing rapidly.

"Keeping abreast of the technology is no small effort for us," Claessen explains, "as the target motion resolution process develops, we are scrambling to keep up technically and mechanically with what our theories tell us this process will provide."

Currently, most missiles tested at the range are tracked by radars and optical instruments such as telescopes and cinetheodolites. Prior to using target motion resolution techniques, radars were only able to provide information on the flight path a missile followed during a test. Highly precise determinations of flight paths, along with missile spin and attitude, were almost exclusively provided by film records gathered by optical instruments.

Target motion resolution techniques allow scientists to rapidly obtain flight path information which approaches the precision of optical data, along with spin and other vehicle motion, by using radar data available shortly after completion of the test flight.

One of the current users of target motion resolution data at the range is the Multiple Launch Rocket System (MLRS) project. According to Mr. Jay Harse, an analyst for MLRS in the Army Materiel Test and Evaluation Directorate, target motion resolution provides improved radar position data on the system during tests.

"The MLRS is a barrage rocket system. This means the rockets are fired in ripples," explains Harse. "We are able to determine, among other things, spin rates and any non-standard activity that cannot always be determined with optics because of smoke and dust during multiple firings."

Mr. Elwin Nunn of the WSMR Instrumentation Directorate's advanced technology office and has been studying the technology since 1974 and is the target motion resolution project leader.

"In the future," according to Nunn, "we expect to see a variety of additional applications. This includes radar angle data improvement, measurement of artillery projectile dynamics, and miss distance determinations on intercepts—to name a few."

Directive Establishes New Audit Procedures

Deputy Secretary of Defense Frank Carlucci has signed a new Department of Defense directive establishing audit follow-up procedures designed to promptly resolve differences between auditors and Defense management officials. Details are described in DOD Directive 5000.42, "Policy for Follow-up on Contract Audit Recommendations," dated August 31, 1981.

Carlucci said, "Secretary of Defense Caspar W. Weinberger and I became convinced early in the Administration that the Department of Defense had not been doing a good job of audit follow-up. Full advantage was not being taken of many of the worth-while recommendations made by our own auditors and those of the General Accounting Office. We decided to devote priority effort to finalizing the policies, regulations and procedures required to install an effective follow-up system in the Department."

Deputy Secretary Carlucci added, "I have repeatedly emphasized that follow-up on audit recommendations is a critical part of the commitment made by President Reagan to improve management in the federal government."

The new directive establishes a system for tracking and reporting significant contract audit reports and recommendations, a procedure for resolving significant differences. It also sets a requirement for periodic evaluation of the effectiveness of the follow-up system operated by the military services and defense agencies.

An important feature of the new directive is a requirement that DOD components designate a senior acquisition official, review board, or panel that is independent of the contracting officer to review differences between contracting officers and contract auditors on all significant contract audit recommendations. The official or board will conduct an impartial review of differences on pricing proposals and all other types of audits conducted by the Defense Contract Audit Agency and make a recommendation for disposition.

The DOD is required to resolve all significant audit findings and recommendations within six months of audit completion. DOD policy requires that there be effective follow-up action taken on implementation of the findings and recommendations.

The provision of DOD Directive 5000.42 are effective immediately. (Copies of the new directive, DOD 5000.42, are available in the Defense News Branch, OASD(PA) 2E757, The Pentagon.)

HEL Assessing AAH Refueling/Rearming Combat Scenario

The U.S. Army Human Engineering Laboratory, Aberdeen Proving Ground, MD, is taking a close look at how the Advanced Attack Helicopter will be refueled and rearmed during combat and how several other factors, such as a chemical/biological environment, will affect the operation.

In a typical scenario, attack teams are composed of five gunships and three scout aircraft. The gunships wait in a forward holding area while scout helicopters search for target and firing positions.

When the positions are found, the scout calls in the gunship for engagement. After the attack helicopter expends its ammunition, it returns to a Fuel and Rearming Point (FARP) to get geared up for the next run.

What HEL is studying is how the FARP will operate, what the turnaround time will be, how many soldiers it will take to do the job, whether a nighttime operation will prove a problem, and if a chemical/biological environment will hamper the mission.

Ten soldiers from the Materiel Testing Directorate's Military Support Division are acting as FARP personnel, loading eight 99-pound Hellfire missiles and 38, 29-pound 2.75 folding-fin aerial rockets (FFAR) into a mock-up of the AH-64 Advanced Attack Helicopter. The team is also simulating the refueling portion of the operation.

"In theory, a FARP can handle eight aircraft at once; five attack helicopters and three scouts," said CPT Paul Garrett, research and development coordinator for HEL's Aviation Directorate. "The problem is that we tried to determine the minimum number of people needed for one aircraft and we figured five to seven personnel for one gunship."

On the attack bird, the team computes the number of FARP people this way: one refueler and four rearmers, who will take care of the Hellfire missiles and the 2.75 FFAR rockets. These teams include aircraft fire control repairers and weapon system repairers.

What it boils down to is a minimum of 25-30 people in one FARP. This means that over a sustained operation of three days or more, the fire control repairer and the weapons system repairer will probably end up refueling and rearming the gunships. Unfortunately, the soldiers cannot perform maintenance and refuel/rearm at the same time.

The HEL team is performing the fueling and the loading with three-man teams and five-man teams per aircraft. In the three-man operation, two men load the missiles and rockets while the other performs the refueling task. The team makes it somewhat easier and faster, with four soldiers rearming and one refueling.

The target turn-around time for loading eight Hellfire missiles, 320 30mm rounds, and refueling with a five-man crew should be minimized. The environmental conditions of this test do not take into account cold weather, or the blowing of debris or dust from the aircraft's blades, which will continue to run during the operation.

The target time itself does not include loading the 2.75 rockets. That's one problem. Another problem occurs when a nuclear, biological or chemical situation exists. This means that rearming and refueling must be done in the NBC outfit which protects the soldier.

Heat build up is a major problem, and lack of a capability to dissipate heat is another. There's a lack of mobility, and the NBC gloves reduce the sense of touch useful in the operation. There's also an inability to communicate with the rest of the group and with the crew on the craft.

The test has also identified some special problems in loading the Hellfire missiles. First, the rear shoe of the missile fits into a small cut-out in the launching rails. That shoe slides along the rails until the soldier feels it catch, then an upper shoe fits in, completing the loading.

The shoes themselves are relatively small, measuring only about four inches long by three inches wide. At night, it is nearly impossible to see them and the soldier must feel his way.

Another problem peculiar to the Hellfire missile is the space between the missile stations on the gunships. There's not much room, and the small space restricts the two-man team required to handle the Hellfire.

The HEL team will continue its study and data acquisition, and then make its recommendations for remedial action.

BRL Develops Foreign Tank Geometric Description

A 3-person research team at the Army Ballistic Research Laboratory, with the aid of a computer, has developed a 3-dimensional target description of a foreign vehicle, a vehicle that could conceivably vie against U.S. forces in ground warfare.

Actually, the development is a geometric description of a foreign tank. It is currently utilized in BRL's vulnerability analysis studies and as a reference target for NATO countries involved in a cooperative data exchange program.

The developing team, Mr. Murray S. Schmoke, a chemist, Ms. Carol R. Ellis, a mathematician, and Mr. Thomas P. Long, a technician, are all assigned to the Target Assessment Branch in BRL's Vulnerability/Lethality Division.

Schmoke received a BS degree in chemistry from Morehouse College and additional training in mathematics and nuclear engineering at the University of Maryland and Kansas State University.

Since joining BRL, Schmoke has been involved with the analysis and development of computer-based target descriptions of U.S. and foreign vehicles for use in nuclear and non-nuclear vulnerability analyses.

Ellis began her Federal civilian career with the Army as a BRL career intern. She received a BA degree in mathematics at Western Maryland College and has received a master's degree in management and supervision from Central Michigan University. Her work since joining BRL has been in developing computer based target descriptions of U.S. and foreign vehicles for conventional vulnerability analyses.

Long has been a Federal civil employee for 22 years, the last 10 years in BRL's Vulnerability/Lethality Division. He received his training at the Aeronautical Engineering School of Chicago, and has been employed at Martin-Marietta and the Elevator Engineering Co. in Baltimore.

Their detailed target description of a foreign tank, considered a technological breakthrough, increases the ability of scientists involved in vulnerability studies to accurately assess the effectiveness of U.S. and NATO weapons.

In the course of developing target descriptions, where hard information is limited, "knowing the enemy" is an important part of the job of personnel conducting BRL target assessments, since vulnerability codes are used by the U.S. and other NATO countries to evaluate the effectiveness of a weapons system against a threat.

This calls for accurate depictions of a vehicle's dimensions and armor thickness as well as knowledge of the vehicle's interior and exterior components.

The overall objective of this type of analytical study is to develop a 3-D description of an enemy vehicle, describing in detail the armor and critical components of a target and incorporate sound engineering judgements to assure mutual acceptance of a reference target.

MERADCOM Improves Army's Mobility Via Vast R&D Programs

Improving the Army's mobility has been the mission of the U.S. Army Mobility Equipment Research and Development Command (MERADCOM), and its lineal antecedents since 1870.

MERADCOM's story began in the last century when the Army established a series of Engineer Boards. These boards were charged with the responsibility of developing engineer equipment, making recommendations for the improvement of existing equipment, exercising technical supervision over the development of new equipment, and procuring equipment as directed by the chief of engineers.

In 1933, the 35-member board moved into two ramshackle buildings on Camp Humphreys (later renamed Fort Belvoir.) Conditions were far from ideal. Dust, splinters, oppressive summer heat and bone-chilling winter cold.

The advent of World War II meant increased responsibility and expansion, and forced a move into new permanent quarters in 1942. They consisted of a handful of buildings on a 240-acre peninsula jutting out into the Potomac River. The heavily forested site was chosen because it provided a leafy camouflage setting. One early commander even threatened bulldozer operations with his pistol when they got too close to the trees. The new facilities also included an 820-acre test area which also opened that year.

By 1947, the board had grown to 1,632 personnel, and assumed its new identity as the Engineer Research and Development Laboratories (ERDL), a name it was to keep for the next 20 years.

ERDL used a 5-pronged approach involving itself in researching designing, developing, and testing new equipment, adapting or modifying equipment to meet new requirements, adapting commercial equipment for military use; developing techniques for using this equipment; and preparing for quantity procurements. It was a time when the organization came of age and began to take on its present form. Many of the items developed during this period, such as the ERDLator water purification unit and the scissors bridge, are known throughout the Army.

The laboratories left the direction of the chief of engineers in 1962, and came under the control of the Army Materiel Command (AMC), which was established at that time and, in 1967, ERDL was renamed the Mobility Equipment Research and Development Center (MERDC). When AMC was reorganized

RIBBON BRIDGE ERECTION BOAT moves a bridge bay into position at MERADCOM's ponton basin.

in 1973, MERDC became an agency of the newly-formed Troop Support Command (TROSCOM), and it remained part of TROSCOM until 1975, when the center began to report directly to AMC.

In addition to conducting research and development, MERDC became involved in production engineering and standardization and the procurement of engineering services, supplies, and equipment. The center developed such items as a 33-foot bridge to span the rice paddies of the Mekong Delta, a rough terrain crane with a dozer blade that can clear the way to remote sites, and collapsible fuel tanks for instant storage of petroleum products.

MERADCOM was born when MERDC was given full command status in January, 1976. As a command, MERADCOM became responsible for the technology base for items in 15 fields of endeavor. This included developing new and improved systems and making sure these items were logistically supportable as well as cost and operationally effective. That meant MERADCOM would follow an item of equipment through every stage in its life cycle, from concept to obsolescence.

Today, after six years as a command, MERADCOM is still growing and changing. The command's mission encompasses 18 fields of endeavor in four critical areas: mobility/countermobility, survivability, energy, and its seven laboratories have some of the most diverse and unique facilities in the Army.

The Countersurveillance/Counter Intrusion Laboratory has the responsibility of developing camouflage systems to counter enemy sensors, and physical security systems for the protection of military facilities and equipment. To determine what type of camouflage will provide the best protection, against radar detection, the lab is equipped with a unique device called the Macroscope.

The Macroscope enables scientists to study radar "hot spots" by the matching reflections from a scale model with a television picture. These are areas which will need special camouflage or modification to make them harder to see and identify.

Security systems consist of everything from locks to TV cameras and various types of intrusion detectors. The Facility Intrusion Detection System combines all of these systems into a centralized security system to protect military equipment and facilities from theft or sabotage. The system can monitor up to 256 areas from a single command, control and display console.

To protect troops in the field, the laboratory develops field fortifications and rapid excavators. Items that will increase their survivability include foxhole diggers, foxhole covers, and shelters for weapons and equipment.

A 70-ton tank can be immobilized by as little as three pounds of explosive. That's all it takes to sever the tracks of a conventional suspension system. The buried mine, therefore, is one of the most formidable obstacles on the battlefield.

Protecting personnel and equipment by developing mine detection and neu-

tralization systems is the job of MERADCOM's Countermine Laboratory. Among the laboratory's recent accomplishments are the type classification of a tank-mounted mine clearing roller and development of new electronics which will make the Army's mine detectors more reliable in desert environments.

MERADCOM also developed a surface-launched fuel-air explosive mine neutralization unit (SLUFAE) and provided equipment for a test that demonstrated the feasibility of a robotic counter-obstacle vehicle. When fielded, SLUFAE will provide the Army with its first standoff, day and night, all-weather minefield breaching capability.

Soldiers need water in order to fight and fuel in order to move. The Energy and Water Resource Laboratory is working to insure that both are available—now and in the future.

MERADCOM performs R&D, prepares and maintains specifications, and provides technical assistance to Army users of fuels and lubricants. The command is investigating the direct use of crudes and the possibility of using synthetic fuels and gasohol to stretch fuel supplies during shortages.

Another important project is MERADCOM's work with fire resistant fuels for aircraft and tactical vehicles. A hybrid developed by the laboratory is self extinguishing without hampering engine performance.

One of the most critical military requirements during the last fiscal year was water supply equipment for the Rapid Deployment Joint Task Force. MERADCOM served as the lead representative of the materiel development community and designed a "systems approach" to provide equipment which could handle water supplies from source to consumer. Through the Energy and Water Resources Laboratory, MERADCOM developed the technical data packages and tailored the acquisition strategy to procure water supply equipment that met these exacting requirements.

Bridges have been critical to mobility from the time of the first armies. MERADCOM's Marine and Bridge Laboratory has taken the lead in developing wet and dry gap bridges which will meet the challenging and exacting requirements of the modern battlefield.

ARMY has initiated development of its first robotic tactical vehicle following evaluation of a test vehicle at Fort Knox, KY, by its Armor and Engineer Board and training support centers. The robot vehicle, designed for countermine operations, is called the Robotic Obstacle Assault Tank. It consists of an M-60A2 (with turret removed) equipped with mine-clearing roller, mine-clearing lane-marking devices, sensors and robotic/remote controls. Equipment for the Knox test was provided by the Armor and Engineer Board, the Tank Automotive Command, the Marine Corps and the Mobility Equipment Research and Development Command. Based on the success of the test, the Training and Doctrine Command directed that three ROBAT prototypes be built and tested over a two-year period. Lead agencies for the project will be the Engineer Center and the Mobility Equipment Research and Development Command.

An assault bridge capable of supporting up to 70 tons is being developed for the Army's heavy combat division, a design that will enable bridges up to 31-meters long to be carried and launched by the M1 Tank chassis in 5 to 10 minutes. Composite materials will be used to minimize its weight. They will also be utilized in a Class 30 assault bridge which is needed by the light divisions.

Floating bridges have used the same concept for more than a century-pontons were used to support the bridge superstructure. To alleviate the logistical problems involved with this type of construction, MERADCOM engineered the modular ribbon bridge. Launched and retrieved by a modified 5-ton truck, this bridge can be assembled at the rate of 10 feet-per-minute. Improvements made since the bridge was first fielded in 1976 have increased its capacity from 60 to 70 tons. A boat procured under the International Materiel Evaluation Program makes it possible to build the bridge in shallow as well as deep waters.

Believe it or not, the Army has a "Navy" of 1,300 vessels ranging from three-man reconnaisance boats to a 338-foot vessel large enough to travel overseas. The command has a program underway to modernize this fleet with improved communications equipment, engines, sanitary facilities and filtration systems.

Containerization may be an efficient method of shipping large quantities of supplies, but off-loading and transporting international containers from ships at sea to troops on shores present severe logistical problems. The LACV-30, an air cushioned, amphibious, high speed cargo carrier, is MERADCOM's answer.

The LACV can move from ship to shore and inland when port facilities are not available. The craft can travel at speeds up to 50 miles-per-hour and haul cargo over water, land, snow, ice, marshes, swamps, and low brush. With the LACV-30, 70 percent of the world's beaches will be accessible compared to the 17 percent currently accessible with conventional literage craft.

Fuel delivery is another critical factor. MERADCOM has developed an air-transportable tactical mooring system that can handle tankers as large as 25,000 deadweight tons. Once the cargo is on shore, the materials handling equipment of the Mechanical and Construction Equipment Laboratory takes over.

MERADCOM has awarded a 5-year, $61 million contract for rough terrain container handlers which can carry 20- and 40-foot international shipping containers weighing up to 50,000 pounds.

Smaller containers are handled by rough terrain forklifts being developed and improved by the laboratory.

Commercial equipment can perform many of the Army's construction tasks. MERADCOM began its Commercial Construction Equipment Program in 1969. Since that time, more than 30 different items have been procured for rear area construction. Commercial construction items meeting MERADCOM specifications are also being procured for the Rapid Deployment Force.

For forward areas, where mobility and versatility are overriding factors, the command has developed the M9 Armored Combat Earthmover. This versatile vehicle is a combination dozer, scraper, dumper, grader, cargo carrier and prime mover. It can prepare and remove obstacles, construct defensive positions, haul materials and prepare and maintain combat routes. One of its most important capabilities involves the excavation of protective fighting positions for tanks and other combat vehicles.

MERADCOM has also been involved in the development of railroad equipment needed to get the M1 tank to the fighting zones. A 140-ton flatcar and tie-down system now being procured can carry two of the over-sized vehicles. Plans call for procurement of 568 flatcars by 1986.

Virtually every equipment system in the field needs power. Electric power generation and distribution equipment for the Army's increasingly sophisticated equipment will be in the forefront of future R&D efforts. That's the responsibility of MERADCOM's Electrical Power Laboratory. The command is developing portable power sources ranging from turbine generators to fuel cells.

SHELTER for TOW anti-tank missile launcher.

A mobile electric power plant consisting of two 150-KW advanced turbine generators has been developed for the weapons control and radar groups of the Patriot Missile System. Its turbines use a regenerative cycle process to preheat air before it is fed into the engine. This helps reduce fuel consumption. The lab is also developing a 1 1-2 KW fuel cell which is inherently silent.

Public law requires DOD and other government agencies to study the possibility of using energy-saving, pollution-free vehicles as soon as possible. The Electrical Power Laboratory is testing battery powered vehicles for the Department of Energy. A survey of a typical Army post shows that 50 percent of ¾-ton utility trucks and 57 percent of 12-ton pickups could be replaced by electric vehicles.

In another joint DOD-DOE program, MERADCOM developed and demonstrated various military applications of solar photovoltaic systems. One system is augmenting the diesel power plant at Mount Laguna Air Force Station in California. The 60-KW system was the world's largest solar power facility when it was opened in 1979. It can supply up to 10 percent of the average load of the diesel plant. Solar cell systems could conserve fuel, reduce the logistical burden and improve the reliability of electronics at many remote sites.

MERADCOM's oldest laboratory is the Material Technology Laboratory, which was established in 1937. Today, the laboratory is the focal point for all materials R&D within the command. It is the lead laboratory within DARCOM and DOD for the study of organic and chemical coatings and research in radiation and health physics. The laboratory's materials research ranges from elastomers (its one of the last bastions within the Army) to chemical coatings, plastics, metals, coated fabrics, ceramics packaging, and composite materials.

In addition to its R&D work, MERADCOM conducts an engineering program to provide industry with specifications and other technical data. This program supports the quantity procurement of mobility materiel by the Defense Logistics Agency, Army readiness, and other customers.

MERADCOM's engineering program includes tests of preproduction models, evaluation of engineering changes, standardization engineering, value engineering product improvement program, and technical assistance for other agencies using the command's equipment.

Of the $338 million in MERADCOM's FY82 budget, $82 million will go for R&D, $26 million for OMA and engineering support and $209 million for procurement. About $48 million of the command's R&D budget will go directly into its projects, with the remaining $34 million being devoted to reimbursable funds for customer-related work.

To manage its development programs, MERADCOM uses a computerized Life Cycle Management Model for each piece of equipment. This model enables a manager to follow his item from concept to obsolescence and know its exact status at any point along the line.

Now under the command of COL Theodore Vander Els, MERADCOM employs approximately 1,200 civilians, 20 officers and 50 enlisted personnel. About 390 of these are scientists and engineers with baccalaureate and advanced degrees, others include wage grade and technical and administrative personnel.

MERADCOM has come a long way since its humble beginning. It has grown from a 35-member board into a full-fledged member of the R&D community. World War II, Korea, and Vietnam have all left their imprint. The Command has grown and changed along with the changing face of modern warfare.

As combat scenarios become more and more complex, the role of the combat engineer will take on a new significance. It won't be enough to overwhelm an enemy with numbers. Commanders will have to outlast, outthink, and outmaneuver him. Our soldiers will need to dig in fast, hit hard, and move out quickly. That will be the responsibility of the combat engineer. MERADCOM is here to see that he can meet challenge.

PORTABLE mine neutralization system.

The Army's Improved Scout Helicopter

By LTC Leo J. Asselin, Jr. and LTC Donald R. Williamson

The Army Helicopter Improvement Program (AHIP) is a success story in the checkered history of the Army's efforts to initiate a fully integrated scout helicopter development program. The Army's long struggle to acquire an Advance Scout Helicopter (ASH) were formally initiated in 1972 when contracts were awarded to Bell and Hughes for a New Initiatives Aerial Scout development effort.

The program was structured as a feasibility demonstration to examine current light observation helicopters improvement such as stabilized optics, a night vision system, a computerized navigation system, laser equipment, and improved survivability features. However, this program was terminated in November 1972 when Congress disallowed the FY 1973 budget request, and the Army was instructed to re-evaluate and redirect the program.

Original development efforts included the Observer's Target Acquisition System (OTAS) and the Pilot's Night Vision System (PNVS). However, these were not lost because they were later incorporated into the AH-1G OPTIC aircraft as well as being used to validate Advanced Attack Helicopter (AAH) and ASH vision requirements.

Although effectively causing termination of the New Initiative Scout program, Congress did not dispute the Army requirements for a helicopter which would perform night as well as day aerial scout missions in the mid-intensity combat environment. Requirements for an aerial scout continued, and pending approval to pursue development of a fully capable scout helicopter, a performance improvement modification of the OH-58, designated the OH-58C, was undertaken.

During 1974 and early 1975, a task force studied the aerial scout mission and arrived at the basic requirements and program structure for the ASH. A firm and valid requirement for a scout helicopter was reconfirmed, and the program advanced through ASARC/DSARC I in February 1975 and September 1975, respectively. A draft Request for Proposal was prepared and released to industry for comment, and a project manager was designated.

Both the Army and DOD concluded that some commonality between the ASH and potential future helicopters in the same weight class, such as light attack or light utility, was probably achievable. In March 1976, the DSARC again reviewed the program, reaffirmed support for a helicopter in the ASH weight class, and approved development of a Target Acquisition and Designation System (TADS) and PNVS to be common to the ASH and the AAH.

Subsequent Congressional action denied the ASH FY 1977 fund request as premature, increased the AAH funding to provide for TADS/PNVS development, and called for disestablishment of the ASH Office. Congress, however, indicated that the ASH program would be considered later if proposed by the Army.

Meanwhile in July 1977, a TRADOC Systems Manager (TSM) Office was established at Fort Rucker, AL to represent the user in all scout helicopter matters. HQDA directed TRADOC to update the ASH Required Operational Capability (ROC) which had been approved in November 1974. This updated ROC, submitted in January 1978, emphasized survivability and the incorporation of technology advances not available in 1974.

The DA ASH acquisition strategy was therefore redefined, necessitating update of the Concept Formulation Package to provide quantifiable answers to such questions as scout-attack mix, ASH configuration versus current airframes, and armament and configuration requirements of a new development approach.

The Army's request for FY 1979 funds to support these analyses and tradeoff studies was approved by Congress, and in August 1978, a joint user/developer ASH Special Study Group was formed to conduct a comprehensive ASH Cost and Operational Effectiveness Analysis; to update the ROC, Mission Element Needs Statements; Concept Formulation Package, and Decision Coordinating Paper; and to recommend a preferred system or systems to perform the ASH mission.

In September 1978, the Study Advisory Group (SAG) for the ASH Special Study Group met for the first time and approved the outline study plans. In October 1978, COL Ivar W. Rundgren, Jr. was appointed as the PM designee for the ASH program.

During 1979, a study by European helicopter manufacturers was conducted to determine potential ASH rationalization, standardization, and interoperability suitability within the NATO forces. ASH design study contracts were awarded to Societe Nationale Industrielle Aerospatiale Messerschmitt-Boelkow-Blohm GMBH and Construzioni Aernautiche Giovanni Agusta in April 1979. This effort was completed in June 1979 and resulted in two potentially viable candidates—the Agusta A-129 and the Aerospatiale AS-350—which were then included in overall ASH deliberations.

The ASH Special ASARC of November 1979 recognized that a pressing need existed for full ASH capability. Two factors, however, deterred approval: a solution was required earlier than could be accomplished by a new development, and a new development effort was not presently affordable.

The Special ASARC determined that Mast Mounted Sight technology was sufficiently mature to apply to an existing airframe, and redirected efforts toward a near-term program to furnish needed capability compatible with the near-term attack helicopter fleet, and also serve as a logical step toward longer range objectives for the most survivable combat force.

Following the ASH Special ASARC, the OSD Program Review of December 1979 reinforced the near-term program redirection and led to discontinuance of ASH RDTE funding which was replaced by the AHIP budget line effective FY 1981. OSD also stipulated that OH-58 and UH-1 addressed as AHIP airframe alternatives.

Intensive efforts ensued to reformulate program documentation, acquisition strategy, and complete technical/operational suitability analyses concerning AHIP alternatives. Mission profile "live" tests conducted with the OH-58 and UH-1 concluded that the UH-1 was not suitable because its size resulted in higher detectability and increased main and tail rotor strikes when operating in nap-of-the-earth (NOE) environment. These findings caused reconsideration of the OH-6 as an alternative along with the OH-58.

A pragmatic recognition of potential worldwide versus European-only commitment of the scout with rapid deployment forces caused reinstatement of more stringent operational performance requirements in the AHIP proposed ROC. The Army presentation to the July 1980 ASARC review, therefore, recommended a competitive modification program for performance-improved versions of the OH-58 and OH-6A aircraft. The ASARC principals approved this recommendation.

In July 1980, approval was obtained for a total system acquisition strategy entailing single contractor development and integration of the mission equipment. This approach was selected based on reduction of technical and schedule risks by placement of overall mission equipment/aircraft interface and system performance/integrity responsibilities with the aircraft prime manufacturer.

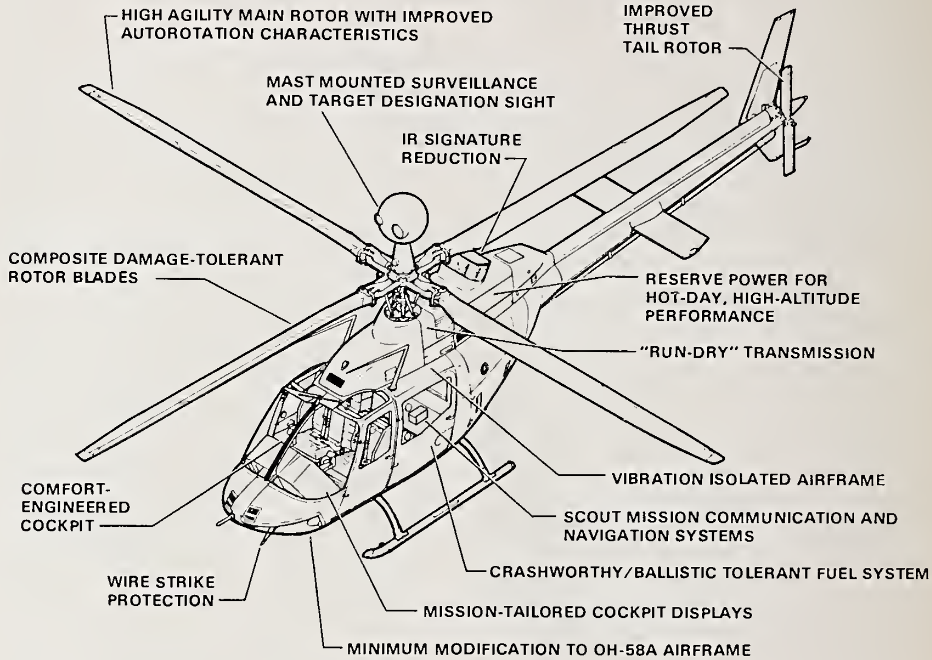
Specific AHIP performance and mission equipment requirements were defined through joint efforts of the U.S. Army user and developer communities.

These requirements are: provide day and night target acquisition and designation; improve NOE communication, navigation and target location capabilities; provide performance and maneuverability margins in NOE and hot-day environments; and achieve an acceptable level of crew workload and survivability. These requirements were articulated in a solicitation to industry in January 1981, and proposals were received from Bell and Hughes in April 1981.

An evaluation board, made up of the best available expertise from Army technical and user elements and industry consultants, very carefully compared proposed system capabilities with the requirements. In preparation for the board, computer simulation models were developed and correlated with available test data. These models were then used to develop independent government estimates of capabilities to substantiate proposed system performance.

On 21 September 1981, after appropriate decision reviews as senior Army and OSD levels, a contract was awarded to Bell Helicopter Textron, Fort Worth, TX, for the development of the Bell Model 406 scout helicopter (Figures 1 and 2). The program includes modification of the U.S. Army OH-58A to the AHIP configuration, qualification, and delivery of five AHIP prototypes to the Army for development and operational tests starting in July 1984.

MODEL 406 DESIGN FEATURES



In order to fully appreciate what the AHIP program brings to the battlefield, we need to recognize that current scout helicopters are inadequate in all areas critical to the scout mission. The OH-58A is significantly underpowered, has only naked eye or binocular-aided target acquisition, limited NOE communications range, and still requires the pilot and/or observer to use a hand-held map for navigation.

Additionally, the OH-58 aircraft does not have the capability to designate a target for terminally guided munition (Hellfire, Copperhead, and U.S. Air Force precision guided munitions). Most scout pilots will acknowledge that the scout mission often overwhelms the capabilities of the current aircraft, existing mission equipment, and crews. Each limitation of the current scout has been addressed and will be eliminated or substantially improved as a result of the AHIP modification program.

The current lack of aircraft performance in the NOE environment is resolved in the AHIP through the following modifications: upgraded engine (Allison 250-C30) which produces up to 650 Shaft Horse Power for 30 minutes or 600 SHP for continuous operation; improved drive system which includes a transmission rated at 435 SHP (609 SHP transient) strengthened drive train components; improved tail rotor thrust; and four bladed main rotor, and three axis stability augmentation system with heading hold.

The power train modifications will provide the following aircraft performance at primary mission gross weight:

Altitude/temperature

4000'/95°F
2000'/70°F
Sea level/59°F
Airspeed (IRP, 4000'/95°F)
Endurance

Vertical Rate of Climb (VRC)

500 Feet Per Minute (RPM)
650 FPM
750 FPM
112 knots
2.4 hours

Controllable in 35 knot winds from any direction

These performance figures are contractually guaranteed by Bell Helicopter Textron and, therefore, represent only the minimum levels of performance

achievable with AHIP. Agility, maneuverability, and stability required in the NOE environment will finally be at the scout pilot's finger tips, improving not only mission performance, but also reducing pilot workload and eliminating numerous accident cause factors.

In order to improve NOE communications, the aircraft will be equipped with two improved FM radios, one VHF, one UHF, and full provisions for a HF-SSB radio. The improved FM will be capable of 40 watts output versus the current 10 watts and have secure voice capability.

The UHF and HF-SSB also have the capability for secure voice. In order to further reduce crew workload, the radio controls have been fully integrated to allow operation and frequency selection by the pilot without removing his hands from the flight controls. NOE communication/navigation improvements will provide necessary aircraft and target location accuracy and facilitate better and more reliable communications between the scout helicopter crew, command elements, and companion aircraft.

To enhance navigation, the aircraft is equipped with a doppler navigation system and a flight plan display selectable in the Mast Mounted Sight display. These systems are fully integrated to give the pilot current position, direction and distance to the next way point and a variety of other required navigational data. The scout pilot and observer will be able to devote their attention to other mission tasks rather than being constantly involved in the process of aircraft navigation.

The modern battlefield will be highly dependent on terminally guided munitions, and the AHIP is ideally suited to not only locate the target but to also provide laser designation for the AAH Hellfire missiles, Copperhead artillery, and U.S. Air Force precision guided munitions.

Incorporated in the Mast Mounted Sight is a laser for ranging and target designation, a TV for daytime imagery, and Forward Looking Infrared for night imagery. The Mask Mounted Sight being located above the main rotor allows the AHIP to acquire and designate targets while masked behind terrain and/or vegetation, thus preventing aircraft exposure to enemy air defense systems.

The navigation, target acquisition and designation, flight instrumentation, and communication systems are all contained in a fully integrated cockpit. Standoff ranges provided by the Mission Equipment Package (MEP), the reduced detectability provided by the mask sight, and the ultimate inclusion of the Multipurpose Lightweight Missile (MLM) self-protection capability, will enable the AHIP to perform its mission with a significant improvement in survivability.

Logistical supportability of the AHIP will also be improved where possible over the baseline OH-58A aircraft. Airframe performance improvements will be accomplished with the goal of providing the additional mission capability with no degradation in airframe RAM characteristics.

Airframe components requiring redesign to achieve performance requirements will undergo continuing review to insure that RAM considerations are included in the design process. Quantitative RAM requirements will be imposed on newly developed mission equipment including the mast sight and will be validated during testing. In addition, extensive reliability growth testing will be performed on the sight to ensure achievement of RAM requirements.

The program, which does not require technological advancement, will incorporate approximately 56 percent (by weight) of existing or 0 risk hardware and components to include major structural elements, engine and transmissions.

The remaining 44 percent, though strictly classified as "new design", is incorporation of existing technology through: scaling of current capabilities to the scout helicopter (e.g., electrical capacity, engine inlet and landing gear sizing, bracketry/wiring/plugs to mount and install new equipment, structure for armament, etc.)—21 percent; modification of existing designs to the specific installation (e.g., rotor blades)—11 percent; and repackaging and integration of existing mission equipment capabilities (TV camera, laser, controls, displays, and FLIR),—12 percent.

In summary, the new modified program will provide day/night target acquisition and laser designation capability through incorporation of the mast-mounted sight into existing OH-58A helicopters. It will also include the integration of improved NOE communication and a doppler navigation system, as well as space, weight, power, and structural provisions for later incorporation of an air-to-air missile system as a self defense capability.

Aircraft performance will be improved to provide a minimum acceptable hot day hover capability and an acceptable vertical rate of climb for worldwide deployment. Quantitative and qualitative improvements in scout mission performance provided by the AHIP will enable the scout pilot to at last actually perform those scout missions that have been too long beyond his and/or the aircraft's capability. The new result will be a significant improvement in the effectiveness of the combined arms team on the modern battlefield.

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LTC DONALD R. WILLIAMSON is the R&D coordinator for the U.S. Army Helicopter Improvement Program. He holds a master's degree in business management and recently completed the Command and General Staff College and an assignment in the U.S. Army Training with Industry Program.

Ten 50-ton tanks, controlled by a computer more than 60 miles away, circle a 5-mile long track at White Sands Missile Range, NM. Originally built to fly target jet formations, the Drone Formation Control System is believed to be the only system of its kind in the Free World.

WSMR Uses Drone System for Remote Control of Tanks

An IBM computer/control system at White Sands Missile Range, originally designed to fly target jet formations, recently proved it also can control tank formations.

The Drone Formation Control System (DFCS), believed to be the only system of its kind in the Free World, for the first time drove ten 50-ton tanks automatically by remote control from a building more than 60 miles away. The tanks were started, formed into one column which drove over a five-mile path, and then split into two columns before stopping.

The DFCS has controlled airplane targets at a separation distance of 200 feet. The tanks circled their oblong path with a separation of 300 feet between tanks at 10 mph. When the 10-tank column separated into two columns, the tanks were separated by 150 feet and travelling at 13 mph.

The $9 million system was conceived in 1974 when it became apparent that a means of controlling multiple targets, flying in formation, would be required for missile testing.

The DFCS's software system required extensive modification in order to control the tanks.

"It was easier to scale-down the sophistication of the DFCS from planes to tanks than it would have been to build up from tanks to jets," said Mr. William Rice, chief of the Target Control Section of the National Range Operations Directorate. "Our main concern was that nobody in this section had ever worked with tanks before."

"While all airplanes fly basically the same way, each tank handles differently," said Mr. William Patterson, the engineer in charge of tank control modification for the DFCS. "We had to devise a software system that could not only keep the tanks at specified distances from each other, but also maneuver them around stopped, stalled or out-of-control vehicles."

The M-47 Korean War vintage tanks were modified by adding remote control devices for steering, throttle and brakes, plus a heading gyro which is read by a microprocessor in the tank and on display consoles in the range control center. This equipment allows the computer, or operators at the control consoles, to control the speed and direction of the tanks and stop them.

The DFCS combines telemetry, command and distance-measuring equipment with an IBM computer. The system is self-contained with its own tracking and control equipment, telemetry data links and display consoles.

Control consoles and the computer are in the drone control center, while a number of subsystems are at various vantage points around the range. Making up the data-link subsystem are the units aboard the tanks, plus those in the range control center and at four other range sites.

Video screens at the control consoles allow operators to monitor the paths of the targets at all times. Operators also can take control of the drones away from the computer and handle it at the consoles in an emergency.

In operation, the DFCS takes measurements of the targets' distances from each of three interrogator stations and feeds those measurements into the computer over telemetry links. The computer uses the measurements to determine the targets' exact position. Comparing the position data with the path data that has been programmed into it, the computer generates commands through the data links to keep the targets on their prescribed paths.

The DFCS was originally manufactured by the IBM Federal Systems Division, Huntsville, AL, under an Army contract. For the tank testing, National Range Operations Directorate personnel worked with IBM on the new software. Instrumentation Directorate personnel built the tank interface equipment and personnel from the range's Army Materiel Test and Evaluation Directorate modified the tanks.

Capsules . . .

MICOM Awards Contracts for MLRS Warhead

The Army Missile Command, Redstone Arsenal, AL, has awarded contracts to five multi-national contractor teams for the cooperative development of a terminal guidance warhead for the Redstone-developed Multiple Launch Rocket System (MLRS).

Approximately $750,000 was awarded to each industrial team from the United States, Great Britain, France and West Germany. The 6-month, concept/international program definition contracts call for the consortia to propose warhead technical approaches and ideas on how the program might be managed quadrilaterally.

From these studies, the four countries will select the best technical approaches, develop system specifications, and prepare requests for proposals for the next stage of development.

MICOM's MLRS Project Office at Redstone Arsenal directs the multi-national development program, the only one of its kind in the Army. Heading the teams, each composed of contractors from all four countries, are General Dynamics Corp., Pomona CA; Raytheon Co., Bedford, MA; Martin Marietta Corp., Orlando, FL; Hughes Aircraft Co., Culver City, CA; and Hunting Engineering of the United Kingdom.

MLRS is a free-flight artillery rocket system consisting of a 12-round launcher mounted on a highly mobile, tracked vehicle. Rockets can be fired one at a time or in rapid ripples. MLRS may be coproduced in both the U.S. and Europe. The four countries signed an agreement in 1979 for the cooperative development of a standard NATO rocket.

Requests for proposals on the terminal guidance warhead were released in the four countries on 31 July 1981. A joint steering committee comprised of representatives from each country met with the U.S. source selection authority at Redstone Arsenal late last year for contract awards. The U.S. Army plans to field the MLRS system in the early 1980's.

Army Activates New Aeromedical Research Lab

Activation of the new U.S. Army Aeromedical Research Laboratory facility, Fort Rucker, AL, was announced recently. The complex, which comprises 116,620 square feet, replaces the 21 World War II hospital wards in which the laboratory was housed since its establishment in 1962.

Ground for the $7.8 million facility was broken on May 2, 1978. The new facility contains laboratories for sensory, biodynamic, and biomedical applications research.

USAAR, one of nine laboratories of the Army Medical Research and Development Command, is internationally known in the field of aviation medicine. As Congressman William Dickinson pointed out: "This new facility will be a tremendous asset to a research lab that has already contributed a great deal to our understanding of aviation and aviator's physical capabilities."

Contract Calls for Bridge Reinforcement System

The U.S. Army Mobility Equipment Research and Development Command (MERADCOM) has awarded $370,050 for the development of a bridge reinforcement system using organic composite materials. Under the terms of the contract, Fiber Materials, Inc. will design a reinforcement system, test the system according to standards provided by MERADCOM, develop a pilot production line and produce 20 composite tensile elements from the pilot production line.

The reinforcement system being developed is similar to the one currently developed as part of the Bridging for the 80s program. Graphite epoxy composites, however, will reduce the system's weight from 95 pounds for the developed steel version to 26 pounds for the new design. Delivery of the reinforcement sets is scheduled for September 1982.

Personnel Actions . . .

DCSRDA Announces 3 Key Personnel Changes

Active military service totaling more than 70 years is represented by three personnel assignments in the Office of the Deputy Chief of Staff for Research, Development, and Acquisition, Department of the Army, Washington, DC.

BG John M. Brown

BG John M. Brown, former DCSRDA deputy director of Materiel Plans and Programs, has assumed new duties as director of Materiel Plans and Programs. Prior to joining DCSRDA, he served as assistant division commander, 2d Infantry Division, Korea.

Other key tours have included assistant chief of staff comptroller, United Nations Command, U.S. Forces Korea and Eighth U.S. Army; commander, 3d Brigade, 2d Infantry Division, Korea; executive to the Comptroller of the Army, Washington, DC; and commander, 1st Battalion, 87th Infantry, 8th Infantry Division, U.S. Army Europe.

Graduated from the U.S. Military Academy, BG Brown also holds an MBA degree in comptrollership from Syracuse University, and has completed requirements of the University of Houston's advanced management program. His military schooling includes the Industrial College of the Armed Forces, the Army Command and General Staff College, and Infantry School basic and advanced courses.

He is a recipient of the Legion of Merit, Bronze Star Medal, Defense Meritorious Service Medal, Meritorious Service Medal with Oak Leaf Cluster, and the Army Commendation Medal with two Oak Leaf Clusters.

BG Joe J. Breedlove

BG Joe J. Breedlove has succeeded BG Brown as DCSRDA's deputy director of Materiel Plans and Programs. This follows a tour in DCSRDA as chief, Aviation Systems Division, Weapon Systems Directorate.

He has served also as commander, Division Artillery, 101st Airborne Division (Air Assault), Fort Campbell, KY; deputy chief and later chief, Plans and Operations Division, Office, Chief, Legislative Liaison, U.S. Army; and as-

sistant chief of staff, G3, 3d Armored Division, U.S. Army Europe.

BG Breedlove's academic credentials include a BS degree in business administration from North Georgia College, and an MBA degree from the University of Georgia. He also completed requirements of the Army War College, Army Command and General Staff College and the Artillery School basic and advanced courses.

He wears the Bronze Star Medal, Meritorious Service Medal, Air Medals with "V" device, and the Army Commendation Medal with Oak Leaf Cluster.


BG Donald S. Pihl

BG Donald S. Pihl, a veteran of more than 22 years of active Army service, is the new deputy director of Weapon Systems, following a tour as chief of staff, 3d Armored Division, U.S. Army Europe.

Commissioned through the Reserve Officer Training Corps, BG Pihl received BS and MBA degrees in business administration from the University of California, and has completed the U.S. Army War College, Armed Forces Staff College, Quartermaster School advanced course, and the Armor School basic course.

His former assignments have included commander, 3d Brigade, 3d Armored Division, U.S. Army Europe; director, Combat Developments Planning Group, and chief, Maneuver Testing and Analysis, Division Research Study Group, U.S. Army Training and Doctrine Command; and commander, 3d Squadron, 11th Armored Cavalry Regiment.

BG Pihl is a recipient of the Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star Medal with "V" device and OLC, Meritorious Service Medal, Army Commendation Medal with two OLC, and the Purple Heart.

Hayes Follows Cuthbertson as Natick Commander

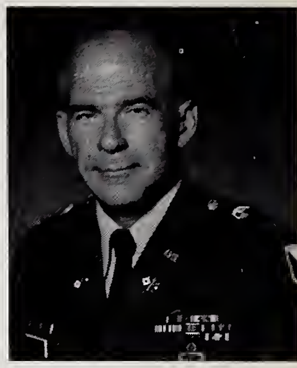

COL James S. Hayes

COL James S. Hayes has succeeded COL Robert J. Cuthbertson as commander of the U.S. Army Natick Research and Development Laboratories, Natick, MA. He was assigned formerly as commander, Western Commissary Region, Fort Lewis, WA.

In addition to serving in Berlin, Germany and two tours of duty in Vietnam, COL Hayes has had key assignments as project officer, Directorate of Food Management, Quartermaster Center, Fort Lee, VA; staff officer, Office of the Deputy Chief of Staff for Logistics, Washington, DC; and chief, Supply Division, Directorate of Industrial Operations, Fort Jackson, SC.

He holds a BS degree from the University of Kentucky (distinguished military graduate), and an MBA degree in food marketing management from Michigan State University. Additionally, he is a graduate of the Quartermaster School, the Command and General Staff College, and the Air War College.

Saunders Named PLRS/TIDS Project Manager


COL Richard Saunders

COL Richard Saunders has been assigned as the project manager for the Position Location Reporting System (PLRS)/Tactical Information Distribution Systems (TIDS), at the U.S. Army Communications-Electronics Command, Fort Monmouth, NJ.

He holds a BS degree in electrical engineering from South Dakota School of Mines and Technology and a master's degree from the University of Minnesota. Additionally, he graduated from the Command and General Staff College in 1970 and the U.S. Army War College in 1978.

COL Saunders has previously served as the chief, Command Control Surveillance Systems Division, ODCSRDA; TRADOC systems manager for ADDS/MSE, Fort Gordon, GA; deputy project manager, PM, JTIDS, Hanscom AFB, Bedford, MA; battalion commander, 501st Signal Battalion, Fort Campbell, KY; and C-E staff officer, HQ USAREDCOM, MacDill AFB, FL.

His awards include the Bronze Star Medal with two Oak Leaf Clusters, Meritorious Service Medal with two OLC, Joint Service Commendation Medal and the Army Commendation Medal.

Urbach Follows Fitch as RTL Deputy Director


COL Walter Urbach Jr.

COL Walter Urbach Jr. is the new deputy director of the Army Research & Technology Laboratories (AVRADCOM), Moffett Field, CA. He succeeds COL John B. Fitch who retired with 28 years service in the Army.

COL Urbach comes to his new post from the Pentagon, where he served four years in the Office of the Deputy Chief of Staff for Research, Development and Acquisition, first as chief of the Management Support Office, and then as chief, Policy, Plans and Management Division.

Col Urbach enlisted in the Air Force, and a year later, entered the U.S. Military Academy and graduated in 1956 with a commission in the Field Artillery and a BS degree. Later, he earned an MBA degree from Georgia Southern College.

A master Army aviator, qualified in both rotary wing (helicopters) and fixed wing aircraft, COL Urbach is a graduate of the Command and General Staff College, and the National War College. He has served in a variety of stateside and overseas assignments including two flying tours in Vietnam. He also served as commander, 1st Battalion, 38th Field Artillery, 2d Infantry Division, Republic of Korea; Secretary of the General Staff, HQ, Sixth Army, Presidio of San Francisco; and in the Office of the Secretary of Defense, the Pentagon.

His awards include the Silver Star, the Bronze Star with Oak Leaf Cluster, Meritorious Service Medal with OLC, Air medal with 17 OLC, Joint Service Commendation Medal, and the Army Commendation Medal with two OLC.

Conferences & Symposia . . .

ERADCOM Schedules 1982 Frequency Control Meet

The 36th Annual Frequency Control Symposium, sponsored by the U.S. Army Electronics Technology and Devices Laboratory, Fort Monmouth, NJ, will be held 2-4 June 1982 in Philadelphia, PA.

Considered the leading technical gathering on all aspects of frequency control and precision timekeeping, the symposium will feature papers devoted to topics such as fundamental properties of natural and synthetic piezoelectric crystals; theory and design of piezoelectric resonators; resonator processing techniques; filters and signal processors; surface wave devices; laser frequency standards; and specifications and measurements.

In addition to technical papers, the symposium will include a centralized products equipment and information exhibit area (independent of Army sponsorship). More symposium information may be obtained from: Commander, U.S. Army Electronics R&D Command, ATTN: DELET-MA (Dr. Ballato), Fort Monmouth, NJ 07703.

Math Center Will Host Advanced Seminar

Recent developments and trends in the understanding of fluidization, suspension, sedimentation, aerosols and related subjects will be reviewed at an advanced seminar on the "Theory of Dispersed Multiphase Flow," 26-28 May 1982, at the Mathematics Research Center, University of Wisconsin-Madison.

A detailed program and additional seminar information may be obtained from Mrs. Gladys Moran, Mathematics Research Center, University of Wisconsin, 610 Walnut Street, Madison, WI 53706.

Corrosion Meeting Will Feature 250 Technical Papers

Corrosion/82, the annual conference of the National Association of Corrosion Engineers, will be held 21-26 March 1982 in Houston, TX.

Considered the international corrosion forum devoted exclusively to the protection and performance of materials, the conference will feature more than 250 technical papers on a wide range of topics. The agenda will also include a plenary lecture, an awards ceremony, exhibits, and technical committee meetings.

Additional conference information may be obtained from the National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77218 or commercial telephone (713) 492-0535.

Awards . . .

Mowrer Gets Army Materiel Acquisition Award

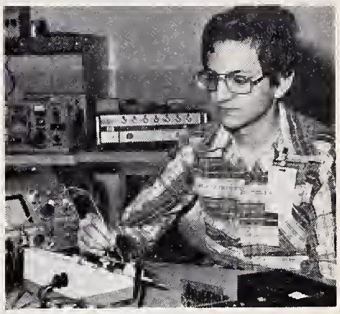
The Secretary of the Army's Annual Award for Outstanding Achievement in Materiel Acquisition has been presented to Mr. Donald W. Mowrer, a physical scientist who retired last year after more than 29 years of federal service at the Army Ballistic Research Laboratory (BRL).

The award recognizes high-level achievements in a project or special management activity as well as significant contributions in procurement and production or R&D management.

Mowrer was honored for his contributions to the improvement of the materiel acquisition process relative to the U.S. Roland project and the Advanced Scout Helicopter (ASH) study group.

In support of the Army's Roland and ASH projects, Mowrer developed and applied the methodology used to evaluate warhead tests and threat weapons effectiveness. His methodology was adopted by both the U.S. Air Force and Navy.

College Senior Cited for Army R&D Contribution



Wade K. Worley

Mr. Wade K. Worley, a senior at Auburn University and a cooperative education electrical engineering trainee at the U.S. Army Aeromedical Research Laboratory (USAARL), Fort Rucker, AL, has received an award under the Army suggestion program for his design and development of a helmet tester device.

The prototype was built in a 1-inch by 2½-inch by 4½-inch aluminum box. The parts were said to be inexpensive and readily available. Already fabricated by others, the device permits Army helmet inspectors to plug the helmet connector into the tester and get an immediate response to the condition of the flight helmet wiring harness and components.

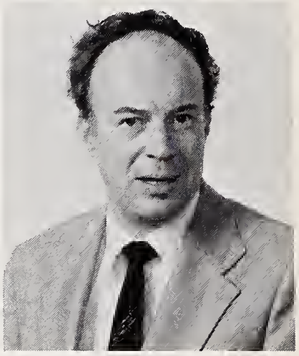
RTL Engineer Receives Commander's Award

Mr. John C. Wilson, an aerospace engineer in the Structures Laboratory, Research and Technology Laboratories, AVRADCOM, was recently presented with the Commander's Award for civilian service. He was cited specifically for professional excellence while serving as head of RTL's Rotorcraft Aerodynamics Group.

Wilson directed a series of highly successful projects that were tested in the wind tunnel facility at the NASA Langley Research Center. His efforts, stated the award citation, directly benefitted Army programs such as the Stand Off Target Acquisition System, Advanced Attack Helicopter, and the UH-1 Helicopter Modernization.

Career Programs . . .

CSL Engineer Joins Senior Executive Service



William Dee

Mr. William (Bill) Dee, a chemical engineer, at the Army Chemical Systems Laboratory, has been selected as a member of the Federal Senior Executive Service (SES) and appointed chief of CSL's Munitions Division.

SES, established in July 1979 by the Civil Service Reform Act, is the personnel system for men and women who administer the Federal Government's top level programs.

A veteran Army chemical researcher with more than 20 years experience in the design and development of chemical munitions, Dee has directed the Army's R&D programs in the production of smoke/obscurant munitions and materials and was technical program manager in the development of the Army's unique binary chemical munitions system.

The Johns Hopkins University awarded him a bachelor of science degree in chemical engineering and a master's degree in administrative science.

A 1977 recipient of an Army R&D Achievement Award, he was appointed to Federal Service in 1959. He has served as a project engineer in the development of incapacitating and riot control munitions and chemical training systems.

Dee's efforts as the technical program manager for binary munitions included the responsibility for the Army's type classification of the M687, 155mm projectile, the Army's first binary munition. His professional affiliations include the American Institute of Chemical Engineers, the American Defense Preparedness Association, Sigma X, and Toastmasters International.

Sowis Begins CSL Technical/Executive Training

Mr. Thomas Sowis, a mechanical engineer, at the Army Chemical Systems Laboratory has started technical executive training in the Office of the Commander-Director at the CSL.

Prior to his selection as the 42nd civilian employee to participate in the 6-month training program, he was assigned to the Producibility Engineering Branch in CSL's Physical Protection Division.

Sowis received a bachelor of science degree in mechanical engineering from the Newark College of Engineering (now the NJ Institute of Technology) in 1961.

That same year, he began his federal career at the Army's Picatinny Arsenal in Dover, NJ. He starts executive training at CSL after participating in a wide variety of technical assignments at Fort Monmouth and at the Naval Ammunition Depot in Colts Necks, NJ.

The CSL executive training program is designed to give the trainee experience in staff work relating to positive management decisions and at the same time provide a meaningful experience to candidates for top executive positions at CSL.

The training period includes a 3-month work experience at CSL and a similar training period at the headquarters of the Army Materiel Development and Readiness Command in Alexandria, VA.

Poziomek Picked for Senior Executive Service

Dr. Edward J. Poziomek, a physical scientist at the Army Chemical Systems Laboratory, has been selected as a member of the Federal Senior Executive Service and appointed chief of CSL's Research Division.

SES, established in July 1979 by the Civil Service Reform Act, is the personnel system for men and women who administer the Federal Government's top-level programs.

Poziomek serves as the CSL point of contact to the National Research Council in a research associate program, and as chairman of the Army Armament R&D Command steering committee for the Armament Institute of Technology.

Earlier this year Poziomek was awarded the Army's Meritorious Civilian Service Medal, the second highest civilian honor granted by the Secretary of the Army for outstanding achievements. He was cited for the scientific contributions he made to an expanding basic research program in chemical-biological defense and in chemical deterrence.

Poziomek was awarded a BS degree in chemistry by Rensselaer Polytechnic Institute and a master's degree and doctorate in the same discipline by the University of Delaware. He is the author or co-author of more than 160 technical publications and 34 U.S. patents and invention disclosures.

"VuPoints" . . .

The following "letter to the editor" was submitted to the Army RDA Magazine late last year by LTC John A. Smith, professor of Military Science at Oklahoma State University. A response to this letter, which appears in boldface, was provided by Ms. Jane Cotton, chief of Public Affairs at the U.S. Army Waterways Experiment Station, Vicksburg, MS.

Dear Sir:

I noted with interest the article "Wes Developing Tactical Bridge Access/Egress System" which appeared in the September/October 1981 edition of Army RD&A. While, as indicated, there is a current void in this portion of bridging operations, it would seem that the method of laying the mat as depicted in the artist's drawing leaves something to be desired. In particular, if the soil conditions are such that the mats are needed, how can a wheeled vehicle—presumedly loaded—expect to be able to traverse the route to lay the mat? I suppose one might believe that the truck could be winched across those areas, but that method would leave voids under the mat which would limit the effectiveness.

Perhaps an alternate method would be for the vehicle to lay the mat ahead *of its own progress and actually drive on top of the mat as it was being laid. This would be done by reversing the load (so that it is laid right side up) and installing a series of rollers on the back of the cargo bed such that the mat is pulled off the truck, around the rollers and under the wheels of the vehicle. This would mean that the vehicle would have to back up while actually laying the mat. As an alternative, a special vehicle would be designed which would have the cab and controls above the cargo bed so that the mat would be pulled off while moving forward. (Driver would be above the load so that he would have forward visibility.) This solution, while perhaps more costly, would probably be faster.*

I would be interested to learn whether either of these approaches were investigated.

JOHN A. SMITH
LTC, AD
Professor of Military Science

SUBJECT: Bridge Access/Egress System Article in *Army R, D & A Magazine*

LTC JOHN A. SMITH
Professor of Military Science
Oklahoma State University
Stillwater, OK 74078

1. Thank you for your interest in our Bridge Access/Egress Project. Your question on the trafficability of the mat laying vehicle is a valid one.

2. Mr. Hugh Green, project engineer, said several people who saw the picture accompanying the article in Army R, D & A Magazine had the same thought. However, the picture shown with the article is only an artist's conception. Mr. Green stated further that the design specifications for the contractor-built mat specified that the mat have the ability to be applied by the vehicle either in forward (when allowed by soil conditions) or in reverse motion (similar to your suggestion). This specification has been incorporated into the mat's design.

3. Since only a few of the panels have arrived recently at the Waterways Experiment Station for testing and evaluation and the mat transporter vehicle system is still under development, there are no releasable photos as of now. Until photos become available we will have to rely on the artist's conception, and perhaps a more detailed explanation in any accompanying copy work.

4. If you would like additional information on our Bridge Access/Egress System Project, or any other project we are working on, please feel free to call.

JANE C. COTTON
Chief, Public Affairs Office

IMEP Provides Alternative Approach to Conventional R&D

Defense research, development and testing can be a long and costly process. However, there is an alternative method for acquiring items and there are those who believe it offers substantial savings in money and time to be gained. Not widely publicized, it is known as the International Materiel Evaluation Program (IMEP).

Basically, the IMEP seeks out items from America's allies to fill U.S. materiel requirements. According to Mr. Fred Schaub, IMEP chief at the Army Test and Evaluation Command, the IMEP is really the Army's portion of the overall DOD Foreign Weapons Evaluation Program. The primary IMEP goal is to reduce U.S. developing costs.

The program's general objectives are to improve upon performance of some U.S. systems by integrating allied technologies where possible, decrease development and purchase costs, reduce the time needed to get items into troops hands, enhance standardization of weapons and components between friendly nations and improve interchangability of weapons, ammunition and other hardware items.

To qualify for the program, there must be a U.S. Army requirement for the item. Additionally, the proposed item must be in production, or at the minimum, in the very late stages of development. IMEP doesn't include cooperative R&D. The intent is to buy the foreign item off the shelf and field it as it is.

IMEP is generally divided into three phases: identification of need and potential candidates to fill the need; a primary evaluation sometimes involving competition between several foreign-produced items, and, if needed, a final phase involving normal U.S. developmental testing and acquisition procedures.

During candidate identification, a need will have been recognized and an active search begun in friendly countries. Once one or more candidates are identified, data is collected on the candidates and a paper evaluation done to determine if the item has the potential to meet the U.S. need. Those items selected as potentially usable then move to Phase II evaluation.

Once a decision is made to move into Phase II, foreign governments and contractors are notified of the U.S. interest in the item.

Once Phase II testing and evaluation is completed, any of several decisions are possible: to accept the item and acquire it by direct purchase or co-production agreement; to reject the item and terminate the project; or to acquire additional data by entering Phase III tests.

One of the most important aspects of the program is that anyone may initiate the Phase I process. Items have been identified by research and development commands, readiness commands, the user, the U.S. Army Training and Doctrine Command, foreign liaison officers, representatives of foreign contractors, and a variety of other sources.

One of the big cost savers in the program is that IMEP relies heavily on foreign-produced data. Only limited technical, and or, user testing is performed to fill existing data gaps.

Due to different developmental concepts, such as the U.S. practice of developing for worldwide deployment, whereas foreign nations usually develop for deployment within country or continent, and because of differences in safety requirements, additional environmental and safety tests are usually required.

The Army has reportedly made substantial progress in the evaluation of foreign items. Several items are considered to be IMEP successes. In order for an item to be termed a success, it must have completed Phase II and have been classified, or is about to be type classified, have a planned procurement by the Army or have entered Phase III.

"Some of the IMEP successes which may fill important Army needs are the 81mm British mortar, the German M.A.N. 10-ton truck, a Swedish small unit support vehicle, a Norwegian light anti-tank weapon, the British bridge erection boat, and the German plastic training ammunition.

In addition to the current IMEP successes, Schaub says Phase I evaluations are currently underway on a variety of items ranging from a German float-sink hose, to a front- and side-loading electric forklift made in the United Kingdom.

Current Phase II evaluations include such items as a replacement for the U.S. smoke pot, a variety of training ammunition items, and improved large caliber bore cleaning brushes.

One of the big advantages of IMEP is that these are generally not high dollar-value projects which would have been put off because of lack of DOD development money.

By purchasing items off the shelf from friendly nations, they can get to soldiers much faster than having to take them through the normal R&D cycle, which can take up to five years, once funds are available. Some items have been tested, and type-classified in as little as eight months.

Another advantage is cost. Our budget varies from year to year, but most of these evaluations cost very little compared to formal research and development costs. It's much cheaper than duplicating the research and development effort," says Schaub.

DEPARTMENT OF THE ARMY

Headquarters
U.S. Army Materiel Development & Readiness Command
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